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Plant Breeding Abstracts

Vol. XXVIII, No. 3

STATISTICS

2443 De Braun, R. M.
An experimental design for three factors at three levels.
Nature, Lond. 1958 : **181** : 209–10.

The design described sacrifices information on the three-factor interactions and on some components of the two-factor interactions. "Geometrically, the design may be viewed as a suboctahedron in single replication with quadruplicate observations at the centre".

2444 Behrens, W. U.
Die Auswertung von nichtorthogonalen Versuchsserien, insbesondere im Sortenprüfwesen. (**The evaluation of non-orthogonal test series especially in the organization of varietal testing**).
Z. Acker- u. PflBau. 1958 : **105** : 1–18.

Equations are provided for determining the effect of various treatments on a property being studied in a nonorthogonal test series. For example the effect of variety and locality on a particular property may be calculated in a series of trials held with different varieties in different places. Formulae for finding an exact and approximate value for the standard error and for determining the significance of varietal effects are included.

2445 Kaltofen, H.
Über die Fehlerschätzung bei Feldversuchen einfachster Struktur. (**Estimation of error in field trials of the simplest structure**).
Z. Acker- u. PflBau. 1958 : **105** : 145–68.

A procedure is described for determining the error of an experiment with only one replication; the method involves carrying out a large number of uniformity trials.

2446 Strand, L.
Die statistische Auswertung von vergleichenden Versuchen. (**The statistical evaluation of comparative trials**).
Silv. genet. 1958 : **7** : 9–12.

The author shows how the *F* test is used to determine whether there is any significant difference between varieties and how the range tests of Newman, Keuls and Duncan [cf. XXVI, 800]* are used for comparing a range of values.

GENETICS

2447 Sakai, K.
(**Theoretical studies on the technique of plant breeding. V. The coefficient of relationship in breeding autogamous plants**).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 86–92. [Japanese].

A method of deriving a coefficient of relationship between any two varieties whose pedigrees are known is described. The procedure is based on the fact that the average relationship between parents and offspring and between sib lines is ½ in both cases. The application of the method to a complex pedigree is exemplified.

2448 Câmara, A.
Porque será que a virulência dos germes patogénicos pode variar? (**How is it that the virulence of pathogenic microorganisms can vary**).
Brotéria 1956 : **25** : 141–53.

Recent developments in the field of microbial genetics are reviewed for the benefit of Portuguese readers.

Proceedings of the International Genetics Symposia, 1956. Tôkyô & Kyôto, September 1956 (1957) : Pp. 12 + 680.

2449 *Beadle, G. W. Gene structure and gene function.* (*pp. 1–4*).

Evidence put forward by a number of workers is discussed and three alternative definitions of the gene are suggested, as follows. (1) "In cellular organisms it may be regarded as a segment of nucleic acid corresponding to a specific macromolecule, often a protein", capable of mutation at many sites, which may be recombined by gene conversion. (2) It may be defined as that unit of genetic material which cannot be subdivided by recombination and would then probably consist of a single nucleotide pair. (3) It may be defined in terms of mutation so that on the basis of the hypothesis that DNA is the primary genetic material of higher organisms the smallest unit of mutation might consist of a single nucleotide pair.

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* References in square brackets are to volume and number of entry in *Plant Breeding Abstracts*

2450 *Demerec, M. Structure and arrangement of gene loci.* (*pp. 20–31*).
Studies are described, most of which have already been published, of transduction experiments with *Salmonella typhimurium.* The following conclusions are reached from the results reported. "(1) Within a gene, smaller units or mutational sites can be identified. (2) These sites have a definite minimum size. (3) Mutants representing changes at different sites of a gene locus, although they are all affected primarily with respect to one function, may differ from one another in various properties. (4) The sites of alleles possessing similar properties are not distributed randomly within a locus, but tend to be grouped together. (5) Genes are not distributed randomly along a chromosome. (6) In *S. typhimurium* and *E. coli*—presumably in bacteria generally—there is a marked tendency for genes that control related reactions to be located close together, an indication that certain gene arrangements confer strong selective advantage." Some terms are redefined, thus "gene locus" or "locus" is used to designate the section of a chromosome occupied by a gene. This section can be subdivided, by crossing over, into smaller, linearly arranged units termed "sites". A gene may exist in different forms or "alleles", which are "nonidentical" if due to mutations at nonhomologous sites or "identical" if their mutation sites are homologous.

2451 *Glushchenko* [*Gluščenko*], *I. E. The phenomenon of polyfertilization in plants.* (*pp. 32–34*).
Most of the work reported here has been summarized from another source [58]. Mention is made of evidence that male nuclei may fuse with cells other than the egg cell or polar cell, causing metabolic changes in the cells surrounding the embryo and thus providing conditions more favourable for its development.

2452 *Lindegren, C. C., Pittman, D. D. & Ranganathan, B. Orderly degradation of the MZ locus by ultraviolet radiation and its regeneration by contact with substrate.* (*pp. 42–50*).
This is an extended version of an article already summarized from another source [1395].

2453 *Müntzing, A. Cytogenetic studies in rye-wheat* (Triticale). (*pp. 51–56*).
The topics covered in this review of work carried out in Sweden and Japan include varietal differences in crossability, serological studies, meiotic disturbances in hybrid progeny of various degrees of polyploidy and seed set in hybrid progeny.

2454 *Tanaka, Y. Genetics in Japan.* (*pp. 73–84*).
Genetical studies with crop plants in Japan during the last half century have included the examination of hybrids between *Triticum* species and varieties of different degrees of polyploidy, genome analysis in wheat and *Aegilops* and in their hybrids, genetical studies and breeding of rice, genome analysis in *Brassica*, studies of chromosome morphology and behaviour and the practical application of polyploidy to crop improvement. Genetical work with microorganisms has recently been begun.

2455 *Lima-de-Faria, A. The four main chromosome regions with distinct cycles of division.* (*pp. 108–09*).
Division has been found to take place at different times in the four regions of the chromosome, thus the kinetochore divides first, followed by the median regions, the chromosome ends and the proximal regions of the arms, in that order. Differential behaviour of the ends of chromosome arms of different length was observed in *Allium cepa*, the ends of short arms dividing earlier than those of medium or long arms.

2456 *Matsuura, H. The mode of division of kinetochores at meiosis.* (*pp. 110–12*).
A plant of *Trillium kamtschaticum* carrying a reciprocal translocation between chromosomes D and E has been the object of this investigation. The translocation has taken place at or near the kinetochore so that whole chromosome arms have been transferred and the types of meiotic configuration observed are described. Both symmetrical and asymmetrical disjunction were observed at early anaphase and it is assumed that the first type results from equational division of the paired kinetochores and the second from their reductional division. Differences in the proportions of each type of disjunction were observed between translocations combining the short arm of chromosome E with the long arm of D, with 69% asymmetrical disjunction, and those combining the short arm of D with the long arm of E, with 53% asymmetrical disjunction. It is suggested that the findings reported here provide evidence for both reductional and equational divisions of the kinetochore at the first meiotic metaphase.

2457 *Mota, M. A new hypothesis of the anaphase movement.* (*pp. 113–16*).
The traction fibre theory and centromere repulsion theory are discussed and it is put forward as an alternative suggestion that the chromosome itself is able to provide energy for anaphase movement by releasing some substance to the interzonal region of the spindle, causing "a poleward reaction which pushes the chromosome and causes the anaphase movement". It is further suggested that the substance released may be the result of a transformation of the spindle material and that it may acquire different characteristics, resulting in the loss of birefringence in the interzonal region. If it has a higher volume than the spindle material from which it derives the resulting expansion of the interzonal region would force the chromosome groups apart. [Cf. XXIII, 2373].

2458 *Ris, H. A study of chromosomes with the electron microscope.* (*pp. 117–20*).
From electron microscope studies of lampbrush chromosomes from amphibian oocytes and chromosomes from insect spermatocytes and plant microsporocytes it is concluded that chromosomes are made up of a characteristic morphological unit, a double microfibril about 200 Å. thick, although the number of these fibrils in each chromosome is not known and is thought to vary between organisms. The two parts of the fibril are twisted round each other giving the impression of a hollow cylinder and in the latest stages of spermiogenesis may be seen to consist of smaller fibrils from 40 to 50 Å. thick and thought to correspond to nucleoprotein molecules. Differences between heterochromatin and euchromatin are thought to be due merely to differences in the degree of packing and coiling of the basic fibrils, which are morphologically identical in the two regions. The implications of these observations in the study of chromosome function and duplication are discussed. The following steps in duplication are distinguished, "(1) replication of the DNA molecule and associated proteins, (2) duplication of the microfibrils and (3) splitting of the bundle of microfibrils into chromatids and daughter chromosomes." The daughter chromatids would contain both old and new component microfibrils.

2459 *Shigenaga, M. On the structure of cell nuclei and chromosomes.* (*pp. 121–25*).
From electron microscope studies of entire meiotic metaphase chromosomes of *Tradescantia reflexa* and sectioned root tip chromosomes of *Hyacinthus orientalis* and *Allium cepa* it is concluded that a chromosome contains a pair of coiled chromonemata each of which is made up of a pair of coiled threads, chromonemata-II, each of which again probably consists of a pair of coiled threads, chromonemata-III. It is possible that further orders of coiled threads exist; the finest threads observed in this study were about 10 mμ in width.

2460 *Wada, B. Atractoplasm.* (*pp. 129–32*).
Evidence is presented and discussed in support of the theory that at the end of prophase the nuclear membrane does not disappear but remains to form the surface boundary of the spindle during metaphase and anaphase.

2461 *Yasuzumi, G. Electron microscopy of chromosomes.* (*pp. 139–41*).
The presence of filaments of about 100 to 200 Å. in diameter has been demonstrated in the salivary-gland chromosomes of Diptera, mature sperm heads of carp and developing sperm heads of sparrow and mouse.

2462 *Beadle, G. W. Some recent advances in* Neurospora *genetics.* (*pp. 142–45*).
Findings with biochemical mutants of *Neurospora* give support to the one-gene one-enzyme hypothesis and are consistent with the theory that conventional crossing over occurs only between genes but that gene conversion may give rise to intragenic recombinations.

2463 *Tanaka, N. & Sugimura, A. The effect of azaserine on mitotic cells of* Tradescantia paludosa, *with special reference to restoration of and protection against the damage caused by azaserine.* (*pp. 189–95*).
The effect of azaserine on root tips of *T. paludosa*, resulting in chromosome aberrations and suppression of mitosis, may be reduced by pretreatment or posttreatment with various aminoacids, except in the case of alanine, which appeared to enhance the effect of azaserine.

2464 *Beatty, A. V. Chromosome aberrations and physiological effects of X radiation in* Tradescantia *microspores.* (*pp. 239–42*).
Evidence is presented indicating that chromosome breakage caused by X irradiation is increased in atmospheres of carbon monoxide containing more than 5% oxygen or of helium with more than 15% oxygen as compared with irradiation in helium alone.

2465 *Gregory, W. C. Radiosensitivity studies in peanuts* (Arachis hypogaea *L.*). (*pp. 243–47*).
Peanut lines of differing sensitivity to X rays [cf. 195] and hybrids among them were treated

with fast neutrons and were found to show differences in sensitivity which were not in line with their response to X irradiation. The behaviour of the hybrid progeny suggested the presence of a qualitative difference in behaviour with respect to the two types of radiation and there is evidence that differences in sensitivity are genetically controlled.

2466 *Kimball, R. F. Modification of the genetic effects of X rays by treatment after irradiation. (pp. 252–55).*
Post-irradiation treatment by exposure to H_2O_2, low temperature or streptomycin or by starvation was found to slow down growth and division in *Paramecium aurelia.* "It has been demonstrated that the mutational process in *Paramecium* is not completed for 1 or 2 hours after irradiation but is completed well before the end of the interdivision interval in which the radiation is given. It is suggested that radiation initiates a mutational process that is irrevocably completed during late interphase and that this process is subject to spontaneous reversal before that time. Agents that delay the late interphase decrease mutation by allowing more time for spontaneous reversal."

2467 *Nishimura, Y. Genetic and cytological studies on the progeny of rice plants exposed to the atomic bomb as well as of those irradiated by X-rays. (pp. 265–70).*
Second generation plants grown from seed collected near the epicentre of the atomic bomb explosion at Nagasaki showed a high frequency of abnormal plants. The most frequent morphological abnormality was dwarfness but others are also described. In addition many plants showed some degree of sterility, which appeared to be inherited in various ways in the different plants examined, although in most cases fertile plants derived from partially sterile plants gave only fertile progeny while partially sterile plants produced segregating progeny. Many of the partially sterile lines were found to show rings or chains of four chromosomes at meiosis, indicating the presence of reciprocal translocations. Tabulated data from a study of meiosis in the F_1 progeny from crosses between plants carrying reciprocal translocations show some suggested interrelationships between interchanged chromosomes. Several of the morphological abnormalities were found to be inherited as simple recessives.
Among plants grown from X-irradiated seed, partial sterility, associated in some cases with rings and chains of four chromosomes, was found in the X_2 progeny segregating from X_1 ears showing low fertility.

2468 *Nishiwaki, Y. Symbolic analysis of metabolic mutations and some discussion of the target theory. (pp. 271–76).*
The gene-enzyme relationship is discussed with particular reference to factors influencing the time between mutation of a gene and the enzyme changes caused by this mutation. It is suggested that "an organism is represented as a function of complex network systems of metabolic circuits in the course of synthesis of another similar network pattern of genetic structure from the substrate and that the genetic information of an organism may be considered to be transmitted to posterity by the repetition of these processes." Problems connected with the target theory and photoreversal of mutations are discussed in the light of this suggestion.

2469 *Schwartz, D. & Murray, C. B. A cytological study of breakage-fusion-bridge cycles in maize endosperm. (pp. 277–79).*
Progeny from crosses between female plants carrying *c wx/c wx, ac/ac* and male plants carrying *C Wx Ds/c wx, Ac/ac* showed fewer single bridges and more double bridges than anticipated when either nonirradiated or γ-irradiated pollen was used. In explanation it is tentatively suggested that fusion between sister chromatids is not always complete at anaphase and that the resulting weak point might rupture during the separation of the chromatids. The double bridges are thought to arise from the inclusion of a whole single bridge into one of the daughter nuclei, thus converting a dicentric chromatid into a dicentric chromosome and initiating a double bridge cycle.

2470 *Yamashita, K. X-ray induced mutations in einkorn wheats with special reference to their complex nature. (pp. 287–89).*
In *Triticum monococcum* 34 mutants have been obtained by X irradiation but in *T. aegilopoides* only two have so far been found. Some of these mutants appear to be identical with mutants induced by Smith. As expected the mutants fall into seven linkage groups, determined by the reciprocal translocation method, but many are of a complex nature and possible explanations of this phenomenon are discussed.

2471 *Eigsti, O. J. Analysis of triploids by use of the pollen tube method. (pp. 290–92).*
The generative nuclei of pollen grains germinated in a solution of sucrose and agar containing 0·01% colchicine were found to undergo mitosis,

enabling the chromosome number to be determined with relative ease and the morphology of the chromosomes to be examined. The use of this method in cytotaxonomic studies of species of *Polygonatum* from Europe and North America is described.

2472 *Hirayoshi, I. The chromosomal relationships in Oryzeae and Zizanieae. (pp. 293–97).*
Data on the frequency and type of secondary association observed in pollen mother cells of *Zizania aquatica, Z. texana, Z. latifolia* and *Zizaniopsis miliacea* are presented in table form and previous studies by other authors are discussed. In F_1 hybrids between *Z. aquatica* ($n = 15$) and *Z. latifolia* ($n = 17$), four to seven bivalents were observed, with 22 univalents, and it is suggested that a set of five chromosomes in each species are homologous. It is further suggested that the 12 other chromosomes in *Z. latifolia* may have been derived from *Zizaniopsis miliacea,* since the panicle form in the two species is similar.

2473 *Jenkins, B. C. A systematic substitution of rye chromosomes in winter wheat. (pp. 298–99).*
Progress made in substituting the seven chromosomes of rye for each of the 21 chromosomes of wheat at the University of Manitoba, Canada, is briefly reviewed. A hardy winter wheat variety, Kharkov-MC 22, and a hardy winter rye, Dakold, are being used and the programme is divided into three stages: (1) the establishment of a monosomic series in Kharkov wheat, (2) the establishment of the seven wheat-rye "addition" lines and (3) the production of the substitution lines by combining the 21 monosomic lines with the seven addition lines, so that 147 substitution lines are theoretically possible. The first stage involves crossing Kharkov with the 21 monosomic lines of Chinese Spring and most lines have so far been back crossed five times to Kharkov. In the second stage several lines with either 21 pairs of chromosomes and one univalent or 22 pairs have been produced by crossing Kharkov with colchicine-treated Kharkov x Dakold plants.

2474 *Knapp, E. The significance of polyploidy in sugar beet breeding. (pp. 300–04).*
[Cf. 777].

2475 *Li, H. W. & Shang, K. C. Cytological studies of sugarcane and its relatives. XIV. Abnormal meiotic divisions in POJ2725 and corn hybrid. (pp. 305–13).*
One of the hybrids described earlier [XXVI, 3549] was found to have $2n = 118$ and therefore had the genomic constitution OOZ. The chromosomes of this plant were amorphous and sticky but in some cases meiosis in pollen mother cells was normal. In other cases abnormalities occurred, resulting in the formation of a restitution nucleus or of haploid microspores of unequal size.

2476 *Matsumura, S., Mochizuki, A. & Sakamoto, S. Triploid sugar beets and their seed production. (pp. 314–17).*
Data are provided on the percentage of triploid seed produced by various combinations of $2x$ and $4x$ varieties, planted in varying proportions.

2477 *Nishiyama, I. Cytogenetic studies in* Avena, *VII. Mutations in the progeny of triploid* Avena *hybrids. (pp. 318–20).*
This paper reports observations of the behaviour of diploid segregates from the hybrids between *A. strigosa* and *A. barbata* previously examined [XXV, 1927 and XXVI, 3223]. Morphological studies indicate that most of the 14 chromosomes of the hybrid plants were derived by recombination among the chromosomes of the A genomes of both parents. Ten groups of mutants which have arisen during the course of 25 years pedigree culture of the diploid segregates are described as follows. (1) The green-inconstant mutant segregates into albino and green in the following generation, is characterized by early mutation and is thought to result from the presence of a balanced lethal. Many dwarf progeny were obtained from it, the dwarf character being determined by a simple recessive gene. (2) Non-heading mutants occurred repeatedly but were maintained only with difficulty. Their growth is delayed, few culms produce panicles, and the internodes are very short. (3) Withered leaf mutants are characterized by early browning and death of the leaves. (4) The wrinkled ear-neck forms show many wrinkles on the neck of the panicle, abnormal panicle shape, semi-dwarfness and dark green coloration of the leaves and culms. (5) Yellow mutants occurred frequently and are slow growing and not winter hardy. The yellow colour is controlled by a simple recessive gene. (6) The albino condition is also determined by a simple recessive gene, linked to the genes governing brown lemma and lemma hairs on the a'_4 chromosome of the B′ genome. (7) In the clustered spikelet or double spikelet types, each pedicel sets more than one spikelet and abnormal culm development may also occur. Three or more recessive genes are involved. (8) Male-sterile and completely sterile forms occurred. The first of these is determined by a simple

recessive gene which usually stops meiosis in the pollen mother cells at diacinesis. (9) The empty glumeless mutant is a dwarf, early-maturing, highly sterile form. It arose in a later generation of the sterile mutant and has abnormally shaped panicles. (10) Spear panicle is another dwarf mutant in which the dwarf character is linked to a reduction in the development of peduncles and panicles. It is suggested that this large variety of mutants may have arisen as a result of structural changes during crossing over.

2478 *Simura* [*Shimura*], *T. Breeding of polyploid varieties of the tea plant with special reference to their cold resistance.* (*pp.* 321–24).

Meiotic abnormalities were noted in both tetraploids $2n = 60$, triploids $2n = 45$ and hypotriploids $2n = 44$, being more marked in the latter two groups. Seeds were obtained only occasionally from triploids and hypotriploids while tetraploids were moderately fertile. All triploid varieties tested were highly cold resistant, this character being correlated with a high sugar content and consequently a high osmotic pressure in the leaf cells. It was found possible to harden triploid varieties more quickly than diploids. Methods of producing triploid varieties are under investigation.

2479 *Yamasaki, M. & Gotoh* [*Goto*], *T. The resistance of polyploid plants to the toxic action of potassium chlorate and its significance for plant breeding.* (*pp.* 325–26).

In the case of radish and perennial ryegrass, tetraploid seedlings were more severely damaged by soaking in 0·1–0·2% $KClO_3$ than were diploid plants while the reverse was true of Ladino clover and sugar beet.

2480 *Kuspira, J. & Unrau, J. Genetic analysis of certain characters in common wheat using the whole chromosome substitution method.* (*pp.* 327–31).

Genetic data are given on awning, earliness in heading, lodging resistance and yield in three series of substitution lines of Chinese Spring with chromosomes from the donor varieties Thatcher, Hope and Timstein. A full report of these investigations has appeared in another paper [263].

2481 *Sears, E. R. & Okamoto, M. Genetics and structural relationships of non-homologous chromosomes in wheat.* (*pp.* 332–35).

Tests of nullisomic-tetrasomic combinations in Chinese Spring have established the following homeologous groups of chromosomes: (1) I, XIV, XVII; (2) II, XIII, XX; (3) III, XII, XVI; (4) IV, VIII, XV; (5) V, IX, XVIII; (6) VI, X, XIX; and (7) VII, XI, XXI. Within each group, six nullisomic-tetrasomic combinations are possible. All but two of these (nulli-XVII-tetra-XIV and XVIII–V) have been secured, five spontaneously in nullisomic lines and the remainder through synthesis from the respective nullisomics and tetrasomics. In all combinations, the tetrasomes compensated for the nullisomes, as shown by plant characters, but this ability differed from group to group and within groups. Nullisomic-tetrasomics involving nonhomeologous chromosomes exhibited no compensatory effect, the tetrasome adding to the deleterious effect of the nullisome in all cases. The genetic relationships indicated by the nullisomic-tetrasomic analysis were confirmed by tests of representative double monosomics. The following combinations of homeologous monosomes were synthesized: II–XIII and II–XX; III–XII, III–XVI and XII–XVI; VI–XIX and X–XIX; and VII–XI and VII–XII. Eleven translocation lines obtained by crossing haploids of Chinese Spring with normal plants have been fully analysed [XXVII, 402]. Seven involved genetically-related chromosomes: VI–XIX (four cases), II–XX, XII–XVI and XI–XXI. The other four affected the following nonhomeologous chromosomes: II–VIII, IV–XII, IX–XI and VI–XVIII. The observation that VI had the most pairing ability is of particular interest since this chromosome is one of the shortest in the complement.

2482 *Stebbins, G. L. The hybrid origin of microspecies in the* Elymus glaucus *complex.* (*pp.* 336–40).

One of the four experiments carried out by the author provided evidence in support of the hypothesis that microspecies of the *E. glaucus* complex may arise through introgression with *Sitanion.* A single back-cross plant was obtained when clones of an artificial F_1 hybrid between *E. glaucus* and *S. jubatum* were interplanted with the former parent. The plant had a seed fertility of 30%; its selfed progeny ranged in seed fertility from 88 to 100%. The second generation obtained from selfing showed the morphological characteristics to be expected in a newly constituted microspecies of the *E. glaucus* complex and was reproductively isolated from the parental strain of *E. glaucus.*

2483 *Yamashita, K., Kihara, H., Nishiyama, I., Matsumura, S. & Matsumoto, K. Polyploidy breeding in Japan.* (*pp.* 341–46).

Work on autopolyploids and allopolyploids of various crops is outlined from the practical point of view. Synthesized polyploids now in commercial cultivation comprise triploid water melons, tetraploid radishes and the amphidiploid *Brassica pekinensis* x *B. oleracea.*

2484 *Jucci, C. Heterosis and resistance.* (*pp. 362–46*).

The author discusses in a general fashion the relationship between heterosis and resistance to diseases and to adverse environmental conditions in plants and animals. The importance of research in developmental physiology for the elucidation of this relationship is emphasized.

2485 *Phinney, B. O. & West, C. A. The growth response of single gene dwarf mutants of* Zea mays *to gibberellins and to gibberellin-like substances.* (*pp. 384–85*).

Five out of nine single-gene dwarf mutants responded to gibberellic acid, gibberellin A or gibberellin-like extracts from higher plants by normal growth. The remaining four showed little or no response. The responsive mutant may be blocked, it is suggested, with respect to the production of gibberellin-like substances which are assumed to be of general occurrence in the higher plants, whereas the unresponsive dwarf may contain mutations which control either metabolism subsequent to the production of the gibberellin-like substances or a process unrelated to the synthesis of such substances. [XXVI, 3277].

2486 *Yamasaki, Y., Sutô, T. & Urano, K. Cytological and serological aspects of heterosis in maize.* (*pp. 396–400*).

Data from F_1 hybrids involving inbreds of Japanese flint and dent from the Corn Belt of the USA revealed that the degree of heterosis for grain yield was significantly and negatively associated with amount of precipitin and with number of heterozygotic pairs of chromosome knobs [cf. XXVI, 3291 and XXVII, 1745].

2487 *Akiba, T. & Takeshi, Y. Inhibitory effect of sodium nitroprusside on the development of resistance of* E. coli *to streptomycin.* (*pp. 401–03*).

Sodium nitroprusside inhibited the development of resistance to streptomycin by an effect other than antibacterial action on resistant mutants or inactivation of streptomycin. The inhibition is ascribed to interference in the cell metabolism.

2488 *Ashida, J. Copper resistance of yeast.* (*pp. 404–07*).

Experiments on the adaptation of *Saccharomyces ellipsoideus* to media containing copper are described [XXVIII, 1060]. Limited data on the inheritance of copper resistance have been obtained from *S. cerevisiae.*

2489 *Imshenezkii* [*Imšeneckij*], *A. A. Experimental variation in micro-organisms.* (*pp. 416–20*).

A short account is given of the production of yeast strains adapted to high temperature, toxic substances, high pH and a medium containing arabinose as the sole carbon source at the Institute of Genetics, Academy of Sciences, USSR [XXVI, 94 and 102]. Variants of *Penicillium chrysogenum* and *Aspergillus* spp. altered in morphology and with an intensification of biochemical activities such as production of gluconic acid and various enzymes have been induced by ultraviolet irradiation. Morphological characters facilitated the selection of mutants with increased biochemical activity, such mutants being found among rough colonies and not among smooth, unchanged colonies or very small colonies with strongly deformed mycelia.

2490 *Jenkins, M. T., Robert, A. L. & Findley, W. R.* (*Jun.*). *Genetic studies of resistance to* Helminthosporium turcicum *in maize by means of chromosomal translocations.* (*pp. 421–24*).

[Cf. XXVII, 4013].

2491 *Middlekauff, J. E., Hino, S., Yang, S.-P., Lindegren, G. & Lindegren, C. Gene control of resistance vs sensitivity to cadmium and actidione in* Saccharomyces. (*pp. 425–27*).

Resistance *vs.* sensitivity to actidione depended upon a single pair of genes, *Acac* [XXVII, 3741]. Three phenotypes with respect to reaction to cadmium were detected: (1) sensitive (*cd*), (2) resistance (*CD*) and (3) capable of mutating to resistance (cd^{M}). The gene responsible for the fermentation of α-methyl glucoside was linked with *CD*, the distance between the two markers being about 6 units. Diploid cultures heterozygous for *CD*/*cd* and *AC*/*ac* were tested under conditions which discriminate between resistance and sensitivity of haploid cultures to cadmium and actidione and were found to be resistant; it was inferred that the genes for resistance were dominant.

2492 *Pal. B. P. & Sikka, S. M. Breeding crop varieties resistant to diseases and pests in India.* (*pp. 435–41*).

This paper deals mainly with work on breeding wheat for resistance to rusts and on the genetics of resistance at the Indian Agricultural Research Institute, New Delhi. Information is given on the reactions of some introduced wheats to individual races of rusts and on a number of the more promising rust-resistant NP varieties. Several independent genes have been found to control rust reactions, resistance in some cases being recessive and in others dominant, according to the varieties. No association has been found between resistance at the seedling and adult stages. In crosses between rust-susceptible *Triticum vulgare* and resistant *T. durum* 'E931', the F_1 plants have proved to be susceptible, subsequent generations giving either a monofactorial or duplicate-factor segregation. Evidence has also been obtained that inhibitors may play a part in influencing the expression of resistance. Monosomic analysis has been initiated to identify the chromosomes on which the genes for resistance and inhibition are situated. Amphidiploids of *T. dicoccum* x *T. monococcum*, *T. timopheevi* x *T. monococcum* and *T. durum* x *T. timopheevi* have been synthesized in order to make use of the resistance of *T. dicoccum* and *T. timopheevi*. Susceptibility appears to be dominant in these crosses, as in *T. vulgare* x *T. durum*. The biochemistry of resistance requires elucidation before an entirely satisfactory genetical explanation may be made. Recently initiated work on the induction of mutation by radiations has revealed a differential sensitivity of chromosomal segments to neutrons. Finally, it is suggested that selection of high-yielding strains in which the leaves do not make a marked physiological contribution to yield may offer one means of minimizing losses in yield due to rust infection of the leaves.

2493 *Ushiba, D., Watanabe, T., Hashimoto, K. & Hsu, Y. Genetic studies on streptomycin resistance in bacteria. (pp. 445–47).*

Experiments on *Escherichia coli* and *Salmonella enteritidis* provided no evidence that streptomycin resistance was directly induced by the drug or arose as the result of its mutagenic action. Two patterns of development of streptomycin resistance are distinguished: "resistance", consisting of a stepwise increase in this reaction, and "indifference", in which highly resistant cells arise by a single step from the sensitive condition or from any step in resistance. The highest degree of resistance may be reached by either indifferent or resistant cells. According to the results of experiments on (1) the rate of mutation from resistance to indifference and from sensitivity to indifference in *S. enteritidis*, (2) transformation in *Diplococcus pneumoniae*, (3) recombination in *E. coli* and (4) replica plating of *Mycobacterium*, indifference and resistance are under independent genetic control, the former being determined by a single locus and the latter by multiple loci.

2494 *Yamasaki, Y. Drug-resistance of the rice blast fungus,* Piricularia oryzae *Br. et Cav. (pp. 448–52).*

Evidence is presented which leads the author to suggest that "the apparent acquired resistance of rice blast fungus to copper sulfate and boric acid was due to superimposition of a reversible resistance, which was acquired by phenotypic adaptation, on a permanent resistance which was acquired mainly by induced mutation with selection."

2495 *Burnham, C. R. The use of chromosomal interchanges to test for the independence of linkage groups established genetically. (pp. 453–56).*

Data obtained by the author together with the results reported by Tsuchiya, have established six independent linkage groups in barley: I, II, IV, V, VI and III + VII. Methods of applying the interchange test are suggested and tentative conclusions concerning the position of linkage groups in the chromosome complement are made.

2496 *Cheng, C.-F. Dosage effect as expressed in the inheritance of starch grains in the internodal parenchyma cells of stem in sugarcane hybrids. (pp. 457–60).*

[Cf. XXVII, 3263].

2497 *Comstock, R. E. & Robinson, H. F. Findings relative to reciprocal recurrent selection. (pp. 461–64).*

Experiments on maize and poultry have indicated that crosses between segregating populations may be improved significantly by reciprocal recurrent selection, a possibility of practical importance in cases of crosses which fall only a little short of economic utility. For the cross between the open-pollinated varieties Jarvis x Indian Chief it has been estimated that a gain of 9% in the mean yield of the cross may be expected per cycle of reciprocal selection.

2498 *Kimura, M. The rate of change of population fitness by natural selection. (pp. 467–71).*

The rate of increase of population fitness due to natural selection can be expressed as

$$\frac{d\bar{a}}{dt} = V_{\mathrm{g}} + \overline{\frac{da}{dt}} + \overline{\sum \epsilon \frac{d}{dt} \log \theta},$$

where a is fitness, t is time, V_{g} is the additive genetic variance in fitness, ϵ is the deviation from additivity due to dominance or epistasis, and

θ is the coefficient of departure from random combination.

Brief consideration is given to the special cases where (1) the genotypic values for fitness are constant, (2) cyclic change in gene frequencies is brought about by three alleles A_1 A_2 A_3 such that A_1 surrounded by A_2 loses fitness by an amount c but gains in fitness by the same amount when surrounded by A_3, A_2 loses in fitness by c when surrounded by A_3 and gains by c when surrounded by A_1 and so on, and (3) a quantity analogous to the potential function exists, termed by the author internal selective value.

2499 *Nei, M. The analysis of covariation by a diallel cross. (pp. 478–81).*

A method of partitioning covariance data from a diallel cross into fixed genetic, unfixed genetic and environmental components, using the genetic algebra developed by Hayman, is described [cf. XXV, 2625 and XXVII, 2442].

2500 *Oka, H.-I. Change of population genotype due to gametic and zygotic selections in hybrids between distantly related varieties of rice. (pp. 482–90).*

The first two sections of this paper recapitulate the author's findings on the effects of gamete-development genes in wide crosses between rice varieties. The original series of reports of this work have been summarized *passim.* In the last section, Mather's partitioning method is applied to $F_0 - F_6$ data on heading date for a cross between the native Taiwan strain 108 and the Peng-lai (=Horai) variety 504.

2501 *Sakai, K.-I. Theoretical studies on plant breeding techniques with special regard to autogamous plants. (pp. 491–97).*

[Cf. XXVII, 2499].

2502 *Takahashi, R. & Yasuda, S. Genetic studies of time of heading in barley. (pp. 498–501).*

Study of a large number of crosses under controlled conditions of temperature and light (24-hr. day) in a greenhouse at the Ohara Institute of Agricultural Biology, Okayama University, Japan, indicated that at least three independent pairs of genes, $Shsh$, Sh_2sh_2 and Sh_3sh_3, are responsible for spring *vs.* winter habit, spring habit depending on sh, Sh_2 and Sh_3 and winter habit on the corresponding alleles. Both Sh_2 and Sh_3 are epistatic to Sh, while sh is epistatic to sh_2 and sh_3. Thus plants with the genotypes $ShSh_2Sh_3$ and $shsh_2sh_3$, for example, have the spring habit, only those with $Shsh_2sh_3$ possessing the winter habit. The pair $Shsh$ is linked with $Hshs$ for hair production on the leaf sheath, with a recombination value of 6–7%. Sh_2sh_2 is linked with Rr for awn barbing and Ss for rachilla hairs in linkage group V, in the order Sh_2–r–s. A series of multiple alleles at locus Sh_2 is responsible for intergrading between spring and winter habits, an allele for a higher degree of spring habit being dominant over alleles for lower degrees of spring habit.

In terms of heading time, response to short photoperiod (12-hr. day) after vernalization for 60 or more days was found to be under polygenic control. The additive genetic variance was sufficient to result in a high heritability (89%) of this reaction. Nonadditive genetic variance appeared to be nonsignificant, suggesting that neither dominance nor epistasis was involved. The response to long photoperiod (24-hr. day), as shown by the heading time of plants raised from vernalized seed, also proved to be polygenic, the estimated heritability being 76%. Response to long photoperiod did not however appear to be of major importance in determining earliness, since the difference between the times of heading of the earliest and latest F_2 plants was only 10 days.

From an analysis of grade of spring habit and reactions to long and short photoperiods after vernalization, in relation to heading times under field conditions, it was concluded that photoperiodic response to short days is the most important physiological factor determining earliness in autumn-sown barley in southern Japan.

2503 *Burdick, A. B. Constant parent regression analysis for studies of gene action in heterosis. (pp. 506–10).*

The mathematical basis of constant parent regression analysis for estimating dominance and epistasis is described. An application of the method for elucidating the genetics of plant size and earliness in tomatoes has been summarized previously [XXV, 604 and 3504].

2504 *Sprague, G. F. & Russell, W. A. Some evidence on type of gene action involved in yield heterosis in maize. (pp. 522–26).*

Data on the yields of crosses between the unrelated and heterozygous strains Lancaster and Kolkmeier after successive cycles of recurrent selection have provided no evidence that overdominance is of major importance in causing heterosis for yield. The interstrain combinations C_0 (Cycle$_0$) x C_0, C_1 x C_1 and C_2 x C_2 have shown a trend of increasing yield, suggesting that complete or partial dominance is of primary importance. If overdominance had been operative, the interstrain crosses would be expected to exhibit a trend of decreasing yield with successive cycles of selection, since recurrent selection would have led to an increasingly complementary relationship between the genotype of the tester and that of each strain and thus the strains would have become increasingly similar in genotype.

2505 *Benzer, S. The elementary units of heredity.* (*p. 532*).

The results of determining the size of units of recombination by analysis of the rII region in phage T4 are summarized [XXVI, 532].

2506 *Fukumi, H. Fundamental considerations of the variation in host-range of bacterial viruses.* (*pp. 533–38*).

On the basis of work on phages T1 and T3 of *Escherichia coli*, it is suggested that host-controlled variation in phenotype and host-range mutation may be interpreted on a common basis, viz. the relative stability of the modification brought about by the host in the phage DNA.

2507 *Garnjobst, L. & Wilson, J. F. Heterocaryosis and protoplasmic incompatibility in* Neurospora crassa. (*pp. 539–42*).

[Cf. XXVII, 1008].

2508 *Giles, N. H., Partridge, C. W. H. & Nelson, N. J. Genetic control of adenylosuccinase in* Neurospora crassa. (*pp. 543–46*).

[Cf. XXVII, 3669].

2509 *Ikeda, Y., Ishitani, C. & Nakamura, K. A high frequency of heterozygous diploids and somatic recombination induced in imperfect fungi by ultraviolet light.* (*pp. 547–49*).

The frequency of diploidization induced by ultraviolet irradiation of conidia from heterocaryons of *Aspergillus oryzae* and *A. sojae* reached 0·3%. Irradiation of heterocaryons from the crosses yellow lysineless haploid x green leucineless diploid and green leucineless diploid x green lysineless diploid resulted in at least three possible triploids and one possible tetraploid. The effect of ultraviolet treatment in increasing the frequency of recombination in diploids varied according to the species, being marked only in the case of *A. sojae*. The possibility of breeding for kojic-acid production by selection of recombinants from heterozygous diploids is considered.

2510 *Ryan, F. J. Mutation in non-dividing bacteria.* (*pp. 555–58*).

[Cf. XXVI, 920].

2511 *Stent, G. S. The distribution of the parental DNA among bacteriophage progeny.* (*pp. 559–60*).

Bacteria were infected with T2 parental phage containing P^{32} and the sensitivity of the progeny phage to inactivation by P^{32} decay was compared with the rate of death of the parental population. The majority of the progeny were inactivated at a rate of less than 0·2% of the rate of death of their parent, although the progeny population contained an average of 2% of the parental P^{32} per particle. Most of the transferred DNA could not therefore have been widely distributed but must have been confined to a few progeny individuals. Before decay occurred, about 50% of the parental P^{32} transferred to the first generation progeny was transferable to the second generation. As more and more decay took place, less and less of the P^{32} remained transferable to the second generation progeny, until a limit of 25% was reached. This finding is interpreted as indicating that about half of the radioactive DNA is transferred in pieces of sufficient size as to cause an appreciable rate of inactivation through the decay of their P^{32}, while the other half is imported in pieces so small that the few P^{32} atoms contained in each piece kill at a rate too slow for detection. If the slope of the curve for loss of transferability is analysed in terms of a two-component system, comparison with the rate of P^{32} inactivation of the labelled parent indicates that the larger of the two postulated components contains from 10–20% of the P^{32} of the parent. The kinetics of the loss of transferability from second to third generation was similar to that from first to second generation. "This observed dispersion may be due either to fragmentation by replication or genetic recombination, or to a bipartite structure of the DNA of the virus particle of such a nature that one part conserves its integrity while the other part is dispersed" [cf. XXVI, 975].

2512 *Strauss, B. S. Reaction imbalance caused by a genetic lesion in carbon dioxide fixation in* Neurospora crassa. (*pp. 561–63*).

Biochemical aspects of the *suc* mutants, which are deficient in capacity to synthesize oxalacetic carboxylase, are discussed [XXVI, 948 and XXVII, 3670]. The behaviour of these mutants, as well as that of the *car* and *sp* mutants for pyruvic-carboxylase production, suggests that a class of genes exists which exert their effect on enzymatic activity by controlling the ability of the organism to respond to particular exogenous or endogenous conditions by producing more or less of a specific enzyme.

2513 *Sukhov [Suhov], K. S. The problem of hereditary variation of phytopathogenic viruses. (pp. 564–67).*
The induction of variants of tobacco mosaic and cucumber mosaic 2 by high temperature at the Institute of Genetics, Academy of Science, USSR, is described. Variation which was repeated in separate experiments has also been induced by host inoculation with a mixture of two related viruses or a mixture of two unrelated viruses. [Cf. XXVII, 3197 and XVIII, 217].

2514 *Tanami, Y. Virus mutation and multiplication in host bacterial cell. (pp. 568–73).*
Part of the research reported deals with the distribution frequency of mutants of the host-range phenotype h^c in phage T2 in relation to gene replication [XXVII, 3671]. Similar results are given for phage P6. Linkage data on h^c, h^t and the plaque-controlling loci *r* and *tu* are also described.

2515 *Tsujita, M. & Matsui, C. Lysogenic conversion of some genetic characters including sugar fermentation in* Pseudomonas solanacearum. *(pp. 574–79).*
Investigations with phages T–c200 and S–9 indicated that lysogenic conversion may modify sensitivity to other phage and alter the capacity to ferment lactose, mannitol and galactose, and the pathogenicity of the host bacteria. It is postulated that the prophage is able to become a genetic component of the bacterial cell by fixation on the bacterial chromosome at a site which corresponds with the host gene.

2516 *Horowitz, N. H. The genetic modification of enzyme structure. (pp. 623–26).*
A large number of mutants are known which are characterized by loss of enzyme activity, but only a few cases in which mutation has resulted in the production of a modified enzyme or other protein have been recorded, mutants for abnormal hemoglobin in man and with respect to tyrosinase synthesis in *Neurospora* being the most intensively studied of these cases. As reported in another paper [XXVII, 1010], T^s and its allele T^L respectively determine the production of thermostable and thermolabile forms of tyrosinase. The two enzymes resemble each other very closely in other properties. The specific properties of a given protein may therefore be varied independently of one another by gene mutation, a possibility of considerable importance in the evolution of protein structures.

2517 *Iseki, S. Immunogenetic studies on some microorganisms. (pp. 627–30).*
Investigations at the School of Medicine, Gumma University, Japan, have indicated that phages derived from lysogenic *Salmonella* may act as transforming agents of somatic antigens. Antigen-transforming ϵ phage proved capable of transducing a genetic character such as drug resistance, capacity for sugar fermentation, a nutritional requirement or production of flagellar antigen into sensitive cells of *S. anatum.* In *S. macallen*, transduction of streptomycin resistance or production of flagellar antigen occurred in some cases without antigen transformation and coincident lysogenicity.

2518 *Plough, H.H., Roberts, M. R., Ting, C.-Y. & Paton, M. J. Transduction with a new bacteriophage in* Salmonella—*further evidence that transduction is crossing over. (pp. 631–37).*
A heat-sensitive phage (P549) transduced mutant cells of *S. typhimurium* '533' requiring histidine and leucine to the prototrophic condition, H^+ and L^+ transductions occurring singly. Transduction, lysogeny and lysis appeared to be separable activities. The frequencies of transduction and ratios of H^+ to L^+ transductions were approximately the same for P549 and P22. Probably the constant ratios of transduction found for these and other genes are most readily explicable in terms of a linkage system consisting of genes at different positions in relation to a fixed point such as the prophage site. It is postulated that transduction involved the transfer of a chromosomal segment containing either H^+ or L^+, with or without the prophage site, and that this segment was incorporated in the chromosome of the recipient by crossing over. Data on the effects of such factors as age of phage suspension, temperature and γ radiation upon the frequency of transduction provided support to the view that crossing over between major loci in bacteria is essentially similar to crossing over in higher organisms.

2519 *Terada, M. Genetic studies on bacterial viruses. (pp. 638–44).*
Seven gene loci for plaque types and host range, comprising a single linkage group, have been identified in phages isolated from *Salmonella gallinarum* and *S. sendai* [XXVII, 2452]. A host-range mutant, *h*, behaved as a phenocopy for heat susceptibility. Dissociation for plaque type in s phages is described [XXVII, 2475]. A fourth line of investigation has shown that nonlysogenic strains of *S. typhimurium* and *S.*

gallinarum do not contain O(I) antigen but contain this antigen when lysogenized by appropriate phages, the reaction of the lysogenized bacteria to antiserum being under the control of the hereditary constitution of the phage.

2520 *Winge, Ø. The inheritance of fermentative ability in yeasts through complementary gene action. (pp. 651–55).*
The author gives an account of the complementary role of genes at loci *Me, M, R* and *G* in the hydrolysis and fermentation of melibiose and raffinose [2044 and XXVII, 3742].

2521 STUBBE, H.
Stand und Entwicklung genetischer Forschung in der Deutschen Demokratischen Republik. (**The position and development of genetical research in the German Democratic Republic**).
Wiss. Z. Martin-Luther-Univ. Halle-Wittenberg 1956/57 : **6** : 713–34.
The development and achievements of genetical research in Eastern Germany since 1945 are surveyed. Studies on the inheritance of desirable characters in crop plants, heterosis, the inheritance of sex, interspecific hybridization, polyploidy, vegetative hybridization and rapprochement, chimeras, evolution and population genetics, cytology and cytogenetics are mentioned.

2522 (**The state and prospects of development of botany in the Soviet Union**).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 1727–34. [Russian].
In a resolution passed by the All-Union Society of Botany on 17 May 1957, attention was called to the insufficient attention being given in the Soviet Union to genetics and plant breeding, particularly the basic principles of inheritance and the problems of heterosis and polyploidy, and to the production of useful mutants, the application of distant hybridization and the genetics of lower organisms. Other subjects named as being neglected were the origin and nature of species in cultivated plants, collection and introduction from different parts of the world and the publication of the Cultivated Flora.

Symposium on bacterial and viral genetics.
Aust. J. Sci. 1957 : **20** : 71–76.
Summaries are given of the six papers delivered at the above symposium organized by the Department of Microbiology of the Australian National University and held on 19 August 1957. J. Lederberg contributed an introduction. The other papers included the following:—

2523 *Holloway, B. W. Genetic recombination in* Pseudomonas aeruginosa. *(pp. 72–73).*
Evidence of recombination in *Ps. aeruginosa* has been obtained at the Department of Bacteriology, University of Melbourne, from crosses involving auxotrophic mutants induced by $MnCl_2$. Segregation of various nonselective markers has also been detected. The process of recombination closely resembles that in *Escherichia coli* in several respects. Markers in *Ps. aeruginosa* have been divided into two groups, respectively consisting of "those which are inherited freely from the F^+ parent by the F^- parent and those which fail to be inherited in this fashion". It has been possible to establish a provisional chromosome map of the former group. Current work is aimed at elucidating the mode of genetic transfer and also the manner of inheritance of prophages from a multilysogenic strain derived from the F^+ strain L [cf. XXVI, 909].

2524 *Lederberg, E. M. Lysogenicity and transduction in* Escherichia coli *K–12. (pp. 73–74).*
The close linkage detected between locus *Lp* for maintenance of λ prophage and a cluster of *Gal* loci for galactose fermentation gives support to the hypothesis that λ prophage is incorporated into a definite site on the bacterial chromosome. Transduction mediated by prophage differs from the generalized transduction found in *Salmonella* in several respects: (1) effectively transducing λ arises only by induction of Lp^+ (lysogenic) bacteria, not by lytic growth on the Lp^s (sensitive) phenotype; (2) the transfer is confined to the *Gal* loci linked with locus *Lp*; (3) the transduced clone is unstable, the partial diploid or heterogenote continuing to segregate for Gal^+/Gal^- but for no other marker characters; (4) the recipient may be lysogenic, immune or sensitive, provided that λ is adsorbed; and (5) lysates produced from heterogenotes are of the type HFT (high frequency of transduction). A close correlation between transduction and lysogenization was observed. From Lp^s recipients, either pure Lp^+ or Lp^{rs} heterogenotes were obtained. The latter heterogenotes were nonlysogenic, being immune from λ, but every segregate was of the phenotype Lp^s. Transductions involving the addition of prophages related to λ as other markers for the recipient showed the following significant features: (1) heterogenotes segregated with respect to lysogenic/sensitive for one or both of the prophages,

along with two *Gal* loci; (2) linkage of Gal type and λ marker; and (3) continued segregation of one or both of the prophages in segregates already pure for Gal type. Superinfection of lysogenic bacteria with related phages resulted in unstable doubly lysogenic bacteria or prophage substitution. The author regards lysogenization as a more restricted form of transduction, with the phage behaving as the vector as well as the passenger in the transduction of lysogenicity.

2525 Bilquez, A. F.
Développement de l'emploi des radiations ionisantes dans les recherches relatives à l'agriculture. (**The development of the use of ionizing radiations in research relating to agriculture**).
J. Agric. trop. Bot. appl. 1957 : **4** : 446–52.

This review includes an outline of the present state of research on using X rays, neutrons and radioactive isotopes for producing hereditary variations. Also mentioned is the employment of radioactive isotopes in physiological studies.

2526 Li, C. C.
The genetic variance of autotetraploids with two alleles.
Genetics 1957 : **42** : 583–92.

A more detailed analysis, based on that of Kempthorne [XXV, 2644 and XXVII, 1063], is described and discussed.

"When there are only two alleles, the partition of the genotypic variance of an autotetraploid random mating population with random chromosome segregation can be easily executed by the method of repeated linear regression. The four variance components thus obtained are identical with those obtained by a more general procedure. A numerical example has been given to illustrate the new method. Several special cases have also been discussed.

"If the eight chromatids segregate at random during meiosis, the additive component of the genotypic variance has been isolated but the author has been unable to obtain simple expressions for the digene, trigene, and quadrigene components."

2527 Brewbaker, J. L.
Pollen cytology and self-incompatibility systems in plants.
J. Hered. 1957 : **48** : 271–77.

Surveying the literature on systems of self incompatibility in homomorphic species, the author finds that in general binucleate pollen grains are associated with stylar inhibition and the gametophytic type of self incompatibility, whereas trinucleate pollen grains are associated with stigmatic inhibition and the sporophytic type. Various exceptions to these relationships are found in the Gramineae, *Theobroma cacao*, *Beta vulgaris* and species of a number of other genera. An almost complete association of pollen cytology with site of inhibition exists however in 42 genera from 23 families. It is suggested that the gametophytic and sporophytic systems may be interpreted as differing in only one major respect, viz. the time of *S* gene action in microsporogenesis. In the former system, the *S* allele is responsible for the production of the inhibitory substance or its precursor at or following anaphase I, but in the latter system such action of the *S* allele occurs before anaphase I. It is further suggested that *S*-allelic action is mediated via the control of the sucrose uptake or metabolism of the pollen grain. The association between pollen cytology and site of inhibition may thus be the result of a difference in the amount of available metabolites in the binucleate and trinucleate grains at anthesis, this difference being ascribable to the effect of the second mitotic division undergone by the trinucleate grains. It is noted that unpublished work by the author and Majumder on *Petunia* has corroborated the observations of investigators of other genera that the stylar inhibitory substance is active in water extracts.

2528 Sinsheimer, R. L.
First steps toward a genetic chemistry.
Science 1957 : **125** : 1123–28.

Recent research on the chemical structure of DNA and on its role in heredity, microbial transformation and virus infections is reviewed.

2529 Zinder, N. D.
Lysogenic conversion in *Salmonella typhimurium*.
Science 1957 : **126** : p. 1237. (Abst.)

S. typhimurium 'LT2' becomes serologically altered when lysogenized by phage P22. The lysogenized cells are agglutinable by anti-O1 serum, whereas the nonlysogenized cells are not. The new antigen is produced not only by the temperate phage but also by virulent mutants. Its production is not therefore a consequence of lysogenization. A phage related to P22 is associated with the formation of an as yet unclassified antigen and is partly different serologically from P22. The genes controlling serological behaviour have been mapped by crossing the two phages. The segregates exhibited only parental properties and not intermediate ones. As yet it has not proved possible to separate by recombination the serological specificity of the phage and its property of conversion, indicating that the same gene may be involved.

2530 Herriott, R. M. & Barlow, J. L.
The protein coats of "ghosts" of *coli* phage T2.
J. gen. Physiol. 1957 : **41** : 307–31.

Recombination experiments provided no evidence that ghosts are directly involved in the transfer of genetic information to the progeny. The ghosts appear to be responsible for protecting the phage nucleic acid from degradation by factors in the surrounding medium, attachment of the virus to its susceptible host and delivering the nucleic acid to the interior of the cell. In addition, the ghosts have a number of biological actions which resemble those of the parent phage.

2531 Holloway, B. W. & Jennings, P. A.
An infectious fertility factor for *Pseudomonas aeruginosa.*
Nature, Lond. 1958 : **181** : 855–56.

In previous experiments strain L failed to convert strain 1 to F^+ behaviour [XXVI, 909 and XXVII, 32]. A strain-1 auxotroph requiring tryptophane and resistant to streptomycin has however been converted to the F^+ condition by a doubly auxotrophic streptomycin-sensitive recombinant (R629) requiring isoleucine + valine and of mating type L. It is concluded that a factor (FP) similar to F in *Escherichia coli* 'K12' controls fertility, strain 1 being FP^- and L and R629 FP^+. No reason can be given at present for the failure of L to infect strain 1 with FP. In this connexion it is noted that different lines derived from strain 1 have varied in the facility with which they were converted. No conversion of FP^+ to FP^- was achieved by acriflavine treatment [cf. 89]. Attempts to obtain FP^- mutants from FP^+ strains by selection for mutants with higher motility also failed [cf. XXVII, 3688].

2532 Anderson, T. F.
Pedigrees of exconjugants in *Escherichia coli* K-12.
Science 1957 : **126** : p. 1229. (Abst.)

Pedigrees of exconjugants from individual pairs were studied by isolating successive daughters and analysing the genetic markers of clones derived from individual bacteria in the fifth to tenth generation. Hfr exconjugants divided regularly and formed no recombinants. In contrast, a typical fertile F^- exconjugant divided irregularly to produce many dead bacteria, the F^- parental type, F^- types with altered morphology, and a number of different viable recombinants. The last-mentioned types did not segregate into pure clones until after the third, or in some cases, the tenth division. These results suggest that (1) genetic material transferred from an Hfr to an F^- bacterium persists for a number of divisions, during which time it may recombine frequently with the F^- genetic material, (2) many recombinations may be nonviable and (3) a large number of viable recombinants may involve morphological characters not utilized in the genetic analysis.

2533 Edwards, A. W. F.
Number of mating types required for balance in multipoint linkage programmes.
Nature, Lond. 1958 : **181** : 503–04.

In order to allow for differential viability in segregating phenotypes, the numbers of progeny from coupling and repulsion back-crosses should be equal in respect of all pairs of loci. The condition for balance is represented by the matrix equation $a^*.a = q\,I$, where a has p columns and q rows, p being the number of loci and q the number of mating types in the balanced set. The enumeration of matrices of this type is equivalent to the enumeration of anallagmatic pavements.

2534 Giles, N. H., de Serres, F. J. (Jun.) & Barbour, E.
Studies with purple adenine mutants in *Neurospora crassa.* II. Tetrad analyses from a cross of an *ad*-3A mutant with an *ad*-3B mutant.
Genetics 1957 : **42** : 608–17.

Further results have been obtained supporting the conclusions reported previously [XXVII, 1093]. Evidence has also been obtained for positive rather than negative chromosome interference in the *ad*–3 region of linkage group I.

2535 Rifaat, O. M.
Measuring linkage in *Neurospora crassa.*
Genetica 1957 (1958) : **29** : 146–54.

It is emphasized that centromere distances derived from tetrad analyses in *N. crassa* cannot be equated with distances in centimorgans estimated from random spore data. The author explains how Fisher's scoring system supplies efficient estimations of recombination fractions and how Kosambi's formula may be successfully used in mapping chromosomes in *N. crassa.*

2536 SHULT, E. E.
The hypothesis of chromatid interference.
Experientia 1958 : **14** : 58–59.

Chromatid interference has been considered to be of two kinds: (1) positive interference where one exchange point increases the probability that a second exchange point will occur on a different strand and (2) negative interference where the occurrence of one exchange point increases the probability that a second will occur on the same strand. It is pointed out that on this basis an excess of 3-point double exchanges cannot be classified as either positive or negative interference. Chromatid interference is then defined as any ratio of the four kinds of double exchanges different from 1 : 1 : 1 : 1 or 1 : 2 : 1 if the two kinds of 3-strand double exchanges are not distinguished. The author claims to have proved that a ratio of double recombinations differing significantly from 1 : 1 : 1 : 1 is evidence of chromatid interference. It is shown that the above ratio is an arbitrary one reflecting the model chosen to represent double exchanges; other models giving different ratios are equally valid.

2537 HARDIN, J. W.
The annotation of introgressants.
Taxon, Utrecht 1958 : **7** : 52–53.

Different methods of designating introgressant taxa are briefly compared.

2538 SCHWANITZ, F.
Heterosis und Transgression bei dem Artbastard *Bryophyllum crenatum* Bak. x *B. daigremontianum* Hamet et Perrier.
(Heterosis and transgression in the interspecific hybrid *B. crenatum* Bak. x *B. daigremontianum* Hamet et Perrier).
Züchter 1958 : **28** : 3–14.

Polygenic control of characters was shown to account for heterosis in the F_1 and transgression in the F_2 of the above cross. Studies were made of the inheritance of the components of the complex characters, shoot length and plant weight; differences in morphological characters seemed to be related to the production of various growth substances.

2539 HOTCHKISS, R. D. & EVANS, A. H.
Genetic control of enzymatic fine structure as revealed by substrate affinities.
Science 1957 : **126** : p. 1232. (Abst.)

"The deoxyribonucleate particles controlling sulfonamide resistance in pneumococci have been shown to contain three linked marker regions. These three markers may remain linked, be separated, or reassembled by recombination during transformation so that the unit types, designated *a*, *b*, and *d*, and their four combinations can all be produced. The genetic fine structure of this system can also be recognized by its phenotypic manifestations since each of these seven genotypes gives a stable bacterial strain showing its own characteristic degree of resistance toward sulfanilamide. The effect of sulfanilamide is reversed by *p*-aminobenzoate for each of these and the sensitive strain.

"Study of the effects of the markers *a*, *b*, and *d* indicates that they are so highly interdependent that it is concluded that all three determine properties of a single enzyme utilizing *p*-aminobenzoate. Activity of this enzyme and its sensitivity to sulfanilamide can be followed by measuring the synthesis of folic acid. The resistance of the enzyme system proves to be a reliable measure of the resistance of the strain which bears it.

"The small changes induced in the enzyme by the unit markers *a*, *b*, and *d* have been further analyzed through their effects upon affinities for such related drugs as sulfaguanidine, *p*-nitrobenzoate, and *p*-aminosalicylate. Variation of acidity and spatial relations in the drugs has revealed sharp qualitative differences between the different phenotypes. The fine structure of the deoxyribonucleate appears to determine corresponding fine structure in the enzyme protein, which may be explored by means of the affinities for *p*-aminobenzoate and systematically chosen inhibitory analogs."

[Authors' summary.]

2540 FURNESS, G. & ROWLEY, D.
The presence of the transmissible agent F in non-recombining strains of *Escherichia coli*.
J. gen. Microbiol. 1957 : **17** : 550–61.

"A proportion of wild-type strains of *Escherichia coli* unable to recombine with *E. coli* K12F — mutants can 'infect' them with the sex-differentiating character known as F. Of these strains, not all infect the same *E. coli* K12F — mutants and the ease of transfer of F varies among them, suggesting that there are different F agents. This is supported by the finding that there are great variations in the transfer of unselected markers in crosses in which the only difference is the origin of the F factor possessed by the F+ parent.

"Colicinogenicity and F are frequently associated and all of nine strains producing colicin I possess F, but they are not identical, since the two properties have been separated by treatment with cobalt chloride".

[Authors' summary.]

2541 Winkler, U. & Kaplan, R. W.
Vergleich der Transduktionsraten durch verschiedene Phagen und bei verschiedenen Rezipientenstämmen von *Salmonella.* (**A comparison of the transduction rates through different phages and in different recipient races of *Salmonella***).
Naturwissenschaften 1958 : **45** : 62–63.

From various races of *S. typhimurium*, 14 phages differing in their hosts and rate of inactivation by antiserum were isolated. Eleven of the phages could be classed in two groups according to their transduction rate with *S. typhimurium* 'Br4' as donor and *S. schottmuelleri* 'OB19' as recipient. The transduction rates were also estimated for phage 26 with five different recipients and Br4 as donor.

2542 Crescini, F.
Sulla eredità citoplasmatica. (**On cytoplasmic inheritance**).
Ann. Fac. Agr. Milano 1956 : **5** : 121–29.

[Cf. XXVII, 2459].

2543 Sirks, M. J.
Plasma èn genen, geen plasmagenen. (**Cytoplasm and genes, no plasmagenes**).
Natuurw. Tijdschr. 1956 : **38** : 39–56.

This is a fuller version of an article already summarized from another source [XXVII, 1052].

2544 Fitzgerald, P. H.
A case of limitation of phenotypic variation.
Nature, Lond. 1958 : **181** : p. 436.

Results from *Neurospora crassa* provide an example of a physiological limit to what appears to be a cytoplasmically determined variation in the expression of a certain genotype [cf. 35]. This genotype, differing from the wild type by at least two genes, shows two extremes of expression. At one extreme the culture (*bk* phenotype) forms no protoperithecia and instead produces many discrete areas of dark brown pigment, while at the other extreme the dark pigment is absent and weakly developed protoperithecia, which may be functional, are produced in limited parts of the culture (*S* phenotype). Cultures intermediate between these two phenotypes occur. Cultures initiated from ascospores may show any stage in the phenotypic range, but subcultures consist almost invariably of intermediate or *S* phenotypes only. The *bk* phenotype may be induced by suitable treatment to appear or reappear in subcultures, its behaviour being typical of a dauermodification. Prolonged continuation of the treatment intensified formation of the brown pigment and was accompanied by reduced growth rate and decreased viability. This strong expression of phenotype *bk*, in progeny obtained by crossing parents which had been subjected to the inducing treatment, was associated with a high degree of nonviability of the ascospores. Expression of the *S* phenotype in progeny resulting from crossing between untreated parents was associated with a low amount of ascospore lethality.

2545 Powell, E. O.
Criteria for the growth of contaminants and mutants in continuous culture.
J. gen. Microbiol. 1958 : **18** : 259–68.

A mathematical examination is made of the conditions under which contaminants or mutants may establish themselves in continuous culture. Assuming that competition between the original and contaminant organisms is merely in respect of nutrient supply, it is shown that establishment depends on superior growth rate but that, even if growth rate is superior, it may happen by chance that the contaminant is washed out of the culture in the first generations.

2546 Fraser, A. S.
Monte Carlo analyses of genetic models.
Nature, Lond. 1958 : **181** : 208–09.

[Cf. 1141 and 1142].

2547 Dostál, R.
O inhibičních rekapitulacích a jejich perspektivě ve šlechtitelství. (**Inhibitory atavisms and the prospects of their use in breeding**).
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1957 : **30** : 1063–82.

Experimentally induced atavisms with regard to leaf character are reported from Brno for oak, horse chestnut and some other forest trees. They were obtained by defoliation. Induced atavisms in maize and pea are also reported, though these were obtained by different means. The maize plants on being subjected to short growth periods developed ears with staminate flowers at the top and pistillate flowers at the base of the ear and the pea plants which were raised from seed that had been dipped into a weak solution of maleic hydrazide had ternate leaves.

2548 McCloy, E. W.
Lysogenicity and immunity to Bacillus phage W.
J. gen. Microbiol. 1958 : **18** : 198–220.

"Cultures of strain W of *Bacillus cereus* sometimes contained a phage Wα, which could form plaques on strain W itself. Phage Wα was found to be a virulent mutant of a temperate phage, Wβ, with which strain W was lysogenic. Another non-lysogenizing mutant, Wγ, was also isolated which, unlike α, did not form plaques on strain W. The genetic determinants of α, β and γ are probably allelic. Neither phage γ nor phage β formed plaques on bacterial strains lysogenic with β, but these strains were not completely immune, even to the temperate phage. This finding shows that lysogenicity does not invariably confer immunity to the carried phage. The colonial appearance of a strain was altered after lysogenization in a way suggesting that the alteration was due to its incomplete immunity to the temperate phage produced during growth".
[Author's summary].

2549 Clowes, R. C.
Nutritional studies of cysteineless mutants of *Salmonella typhimurium*.
J. gen. Microbiol. 1958 : **18** : 140–53.

It is suggested that the phenotypic differentiation found among cysteineless mutants of *S. typhimurium* represented a series of five metabolic blocks in a pathway of cysteine synthesis.

2550 Clowes, R. C.
Investigation of the genetics of cysteineless mutants of *Salmonella typhimurium* by transduction.
J. gen. Microbiol. 1958 : **18** : 154–72.

The results of transduction experiments provided evidence that cysteineless mutants belonging to the same phenotype [2549] are the result of changes affecting a series of sites which form a closely-linked group and which are presumably situated within a single gene locus. Five such loci were identified. The genetic order of the loci did not however correspond to the sequence of synthetic reactions involved and linkage was only found between two of the loci. The system therefore differs from that demonstrated for mutants requiring tryptophane [XXVII, 594] or histidine [XXVII, p. 595]. One of the loci proved to be linked with the loci controlling tryptophane synthesis.

2551 Metzenberg, R. L. & Mitchell, H. K.
The biosynthesis of aromatic compounds by *Neurospora crassa*.
Biochem. J. 1958 : **68** : 168–72.

Strains of *N. crassa* with single, double and triple requirements for aromatic compounds have been obtained, each requirement depending upon a single gene. The possibility that dehydroshikimic acid plays a central role in the synthesis of aromatic compounds in this organism is discussed.

2552 Hill, R. F.
Comparative study of *Escherichia coli* phage T1 and a plaque type mutant.
J. Bact. 1958 : **75** : 63–71.

"Phage T1 and a plaque type mutant T1s have the same minimum latent period and similar, though not identical host ranges. The phages differ in their rates of absorption to *E. coli* strain B, burst sizes, rates of inactivation by anti-T1 serum, degree of citrate sensitivity and in their plaque count as a function of pH, salt content and glucose content of the plating medium.

"Of eight other plaque type mutants of T1, two were like T1 and six were like T1s in their response to the presence of salt and glucose in the plating medium.

"Phages T1 and T1s also differ in their ultraviolet sensitivity and photoreactivability. The extent of the difference depends upon plating conditions since the dark and light curves for T1 but not for T1s vary with the salt content of the plating medium." [Author's summary].

2553 Ernst, A.
Aberranten in Erbgängen der Heterostylie-Merkmale bei Primeln und ihre Bedeutung für Vererbungs- und Evolutionsprobleme. (**Abnormalities in the inheritance of heterostylic characters in *Primula* and their significance for problems of heredity and evolution**).
Arch. Klaus-Stift. VererbForsch. 1957 : **32** : 15–217.

Intraspecific and interspecific crosses of *Primula hortensis* and *P. viscosa* were studied. It appeared that mutation and exchange of subgenes took place within the complex gene responsible for heterostyly; the mode of action of this complex gene is discussed. A possible origin of dimorphic species from monomorphic species by mutation is considered. [Cf. XXVI, 2009].

2554 Loginova, L. G.
(Changing the properties of micro-organisms by means of transforming agents).
Mikrobiologija (Microbiology), Moskva 1957 : **26** : 485–99. [Russian].

Research on microbial transformation by nucleic acid, published in English, French or Russian, is reviewed.

2555 Day, P. R. & Sherratt, H. S. A.
Anthraquinones in radiation-induced mutants of *Cladosporium fulvum*.
Biochem. J. 1958 : **68** : 385–86.

Mutants induced by X or ultraviolet irradiation contained different anthraquinone derivatives and may represent genetic blocks in the synthesis of the wild type of pigment.

2556 Amenhof, S. Z., de Giovanni, R. & Greer, S.
Induced gene unstabilization.
Nature, Lond. 1958 : **181** : 827–29.

It was demonstrated that the appearance of "pin-point" mutant colonies in two stable strains of *Escherichia coli* (I and I′) grown under conditions allowing incorporation of 5-bromouracil or 5-bromouracil deoxyriboside in the bacterial DNA was the result of the action of these agents. The mutants studied were of two types: those stable for the pin-point condition and those undergoing back mutation to normal with a high frequency which persisted for at least 150 generations. The latter type therefore represented a case of induced permanent instability of the gene. Strain I/Br (resistant to 5-bromouracil) and I/TT (resistant to 2-thiothymine) underwent spontaneous mutation to pin-point. Interference with DNA structure by 5-bromouracil has not affected the stability of spontaneous and ultraviolet-induced mutations for nutritional requirements and 5-bromouracil resistance.

2557 Bender, L. & Kaplan, R. W.
Untersuchungen über Mutationen bei L-Formen von Proteus-Bakterien. **(Investigations on mutations among L forms of *Proteus* bacteria).**
Naturwissenschaften 1958 : **45** : p. 63.

Amongst the L types produced by cultivating *Proteus* in a nutrient medium + penicillin, some stable mutant forms were found. Two of these strains, 52/L and 52/LK, appeared to be less sensitive to ultraviolet rays and heat than the L phenocopies. Irradiation with ultraviolet rays produced a few colonies of cells of normal size in the 52/LK cultures; these were not identical with the original cultures and so a true back mutation had not occurred. Possible explanations of this phenomenon are suggested.

2558 Gluscsenko, I. E. [Gluščenko, I. E.]
A vegetatív hibridizáció kérdésének jelenlegi helyzete. **(The present state of the problem of vegetative hybridization).**
Agrártudomány 1957 : **9** : No. 11 : 1–11.

This review of work on vegetative hybridization with special reference to tomato concludes with the affirmation that hereditary characters may be carried by any part of the organism, that acquired characters are heritable and that new varieties may arise as a result of vegetative hybridization.

EVOLUTION

2559 Lebedev, D. V.
(The evolutionary concepts of Valerij Ivanovič Taliev).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 1338–53. [Russian].

An analysis of the ideas of V. I. Taliev in the early years of this century shows how he emphasized the importance of recombinations of already existing characters, the role of chance and a certain orthogenetical tendency whose nature remained rather undefined. He denied the inheritance of acquired characters and gave examples, such as pubescent forms of *Linum nervosum* in the Crimean hills, where an apparent adaptation proved to be the result of selection. Some of his mutants have later been shown to be tetraploids and he found cases of what N. I. Vavilov later referred to as homologous variation.

2560 Hohlov, S. S.
(The question of the origin of species in plants).
Naučn. Ežegodn. Saratov. Univ. (Sci. Annu. Saratov Univ.) 1954 (1955) : 251–53. [From Ref. Ž. (Ref. J.) 1957 : No. 13 : p. 42]. [Russian].

The mutation theory by de Vries, the theory of heterogeny of Koržinskij and Lysenko's theory of evolution by leaps are all criticized for disregarding the Darwinian concept of evolution as a process involving large numbers of individuals over a wide territory. The author's own concept of evolution along these lines is outlined.

2561 Stebbins, G. L.
(On the hybrid origin of the angiosperms).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 1503–06. [Russian].

Further evidence is adduced in support of the author's view that the chromosome numbers $x = 6$ and $x = 7$ both exist in the Ranales and that species with $x = 19$ are allopolyploids derived from them. It is pointed out that in suggesting the origin of the angiosperms as allopolyploids the original gymnosperms that crossed would be envisaged as much less differentiated than their modern survivors. The same reservation is made for suggestions [cf. XXI, p. 452] that the Contortae and Tubiflorae arose from crosses between members of the Rosales and members of the Geraniales or Celastrales or the Pomoideae as amphidiploids from the Spiraeoideae and Prunoideae; reference is made to certain relic genera such as *Exochorda*, which are in many respects intermediate between the Spiraeoideae and Prunoideae.

2562 Breslavec, L. P.
(The importance of polyploidy in the origin of plant species).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel Biol. (Biol. Sect.) : 1957 : No. **4** : 95–103. [Russian].

The evolutionary role of polyploidy, in particular the effects of autopolyploidy upon the origin and distribution of new species, is discussed, reference being made, *inter alia*, to the findings of Hagerup [cf. II, 381], and to the observations of Müntzing on *Dactylis*, Randolph on *Zea* and Löve on *Rumex* [XIV, 1151].

2563 Stebbins, G. L.
Self fertilization and population variability in the higher plants.
Amer. Nat. 1957 : **91** : 337–54.

Four lines of argument in favour of the suggestion that self fertilization is a favourable condition are discussed in detail: (1) in those genera in which species relationships have been studied from a phylogenetic point of view the self-fertilizing species are in general more specialized morphologically than their cross-fertilizing relatives; (2) many self-fertilizing species possess structures which could have had a high selective value only in connexion with cross fertilization in the putative ancestors; (3) in some groups, self-fertilizing species or populations have originated in historical times from cross-fertilizing species; and (4) recent genetic work has shown that in different genera of the same family or in closely related families the self-incompatible species usually have a similar genetic basis for their self incompatibility. It is suggested that the self-fertilizing habit arose when conditions became unfavourable for crossing and that it may also be connected with dispersal, since many cases are known where cross-fertilizing species occur near the centre of distribution of a genus and self-fertilizing species at the edges of its range. It is pointed out that a high selective advantage is given to weeds and other plants occupying temporary habitats if they are of a genetic type which can build up populations of well adapted individuals from one or two initial colonizers.
The effect of self fertilization on variability in natural populations and the origin of species in self-fertilizing groups are then discussed. Allopolyploidy is suggested as an agent in speciation, the frequency of polyploid types depending on their ability to survive, spread and compete. Finally it is suggested that self fertilization slows down evolution and that self-fertilizing groups can rarely evolve new genera although many have evolved a large number of new species.

2564 Gilmour, J. S. L.
The species: yesterday and tomorrow.
Nature, Lond. 1958 : **181** : 379–80.

The author advocates complete separation between the categories of classical nomenclatural taxonomy and those of experimental taxonomy, in view of the difficulties of redefining the former categories in evolutionary terms.

2565 Kac, N. Ja.
(The question of mutual relations between plants).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel Biol. (Biol. Sect.) : 1957 : No. **4** : 69–78. [Russian].

A plant changes its environment as a result of its own activity and thereby exercises an influence on other plants of the same or different species. Intraspecific and interspecific relations are manifold and include mutual help, interdependence, subordination of one species to another and competition for nutrients. Competition between plants is less sharp than in animals and does not necessarily lead to the destruction of the weakest.

2566 Deborin, G. A.
(The present position of the problem of the origin of life).
Vestn. Akad. Nauk. SSSR (Rec. Acad. Sci. USSR) 1957 : No. 12 : 55–61. [Russian].

[Cf. 1183–4].

2567 Oparin, A. I.
(The present position of the problem of the origin of life).
Uspehi Sovrem. Biol. (Advanc. in Mod. Biol.) 1957 : No. 40 : 158–72.

The substance of this report is the same as that of an article already summarized [XXVII, 1119].

CYTOLOGY

2568 Makarov, P.
Über ungelöste Probleme der gegenwärtigen Zytologie. **(On unsolved problems of present day cytology).**
Wiss. Z. Martin-Luther-Univ. Halle-Wittenberg 1956/57 : **6** : 549–68.

The author maintains that the interphase nucleus consists of homogeneous material and that this view is supported by evidence from various sources. It is emphasised that during prophase the constituents of chromosomes, DNA and a basic protein, are synthesized and new chromosomes arise. Neither the protein conception of genes nor the theory that heredity is linked with DNA are considered proved. Cytological phenomena associated with polyspermy are discussed.

2569 Saito, H. & Ikeda, Y.
Evidences for the bipartite or diploid nuclei in conidia of *Streptomyces griseoflavus*.
Experientia 1957 : **13** : 473–74.

A strain of *S. griseoflavus* was considered to have diploid nuclei in the conidia for the following reasons: (1) during spore formation each nucleus separated into two spheres which later reunited; (2) X-ray inactivation tests of mature conidia gave two-hit curves; and (3) studies of induced biochemical mutants indicated the presence of heterozygous nuclei.

2570 Idelman, S.
Localisation du complexe lipide-protéines à groupements sulfhydrilés au sein du chromosome. **(Localization of the lipid-protein complex with sulphydryl groups within the chromosome).**
CR Acad. Sci., Paris 1958 : **246** : 1098–100.

Evidence of the occurrence of lipoproteins with sulphydryl groups in the chromonemata of metaphase chromosomes of *Tradescantia* and in the dark bands of the giant chromosomes of *Chilonomus* is presented.

2571 Shult, E. E. & Lindegren, C. C.
Orthoorientation: a new tool for genetical analysis.
Genetica 1957 (1958) : **29** : 58–82.

"Orthoorientation consists of the orientation of the chromatid array of one chromosome with respect to the chromatid array of another nonhomologous chromosome at the four strand stage in such a manner that this orientation (or a fixed permutation thereof) is maintained throughout the meiotic process and exhibited in the final tetrad". By reference to data on tetrad distribution arising from a cross between two yeasts differing in respect of four gene pairs, it is shown how orthoorientation may be recognized and used to test for interchromosomal interference, so facilitating the analysis of double exchanges distributed over the two nonhomologous chromosomes.

2572 Hristov, M. & Moskov, I. V.
(The change of mitosis into amitosis during nuclear endosperm development in *Vicia faba* and *Lathyrus variegatus* G.G.).
Naučn. Trud. Selskostopan. Akad. Georgi Dimitrov Agronom. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1957 : **4** : 27–36. [Bulgarian].

Observations on young endosperms of *V. faba* and *L. variegatus* showed that some nuclei divided amitotically about 10 days after flowering. Two kinds of amitosis, both different from those described by other writers, were observed.

2573 Kato, Y.
Cytological abnormalities in the embryo-sac mother cell and endosperm tissue of *Lilium formolongo* Hort. and *Allium fistulosum* L.
Cytologia 1957 : **22** : 69–79.

The observations on cytological abnormalities in the endosperm of *A. fistulosum* have been described in a previous paper [cf. XXVII, 3709].

2574 Resende, F.
On the permanence of the "achromatic spindle" in the nucleus.
Portug. acta biol. 1957 : **5** : 75–77.

It is briefly suggested that the hypothesis of the persistence of the spindle during division and the resting stage offers a more satisfactory basis of interpreting the following phenomena than the view that the spindle does not thus persist:

(1) the independence of the haploid sets in somatic reduction; (2) cases of endomitosis in which a nonfunctional spindle may be observed; (3) the "exomitotic" nature of meiosis II; and (4) centromere interference. A few comments are also made on the possible nature of the separation of sister chromatids to the poles.

2575 Painter, R. B., Forro, F. (Jun.) & Hughes, W. L.
Distribution of tritium-labelled thymidine in *Escherichia coli* during cell multiplication.
Nature, Lond. 1958 : **181** : 328–29.

Investigations on a thymine-requiring strain, the deficiency of which could also be satisfied by thymidine, indicated that the distribution of incorporated tritium from tritiated thymidine among daughter cells grown on an unlabelled medium was very heterogeneous. Relatively large amounts of parental DNA may remain functionally associated in transmission to daughter cells, this association differing from clone to clone. All-or-none splits, in which one member of a nonseparated pair of cells exhibited a high degree of labelling and the other no labelling, were observed in some clones in later generations but never in the first generation.

2576 Vasil, I. K.
Effect of kinetin and gibberellic acid on excised anthers of *Allium cepa*.
Science 1957 : **126** : 1294–95.

Tetrads and one-celled microspores were obtained from anthers excised at leptotene or leptotene-zygotene and cultured in White's medium supplemented with kinetin or gibberellic acid or both substances. The rate of survival of the PMCs was very high.

2577 Koopmans, A.
Die Persistenz der Chromosomenspindelfaser. (**The persistence of threads of the chromosome spindle**).
Naturwissenschaften 1958 : **45** : 66–67.

After treating a root tip of *Allium* with a 0·1 M solution of aminopyrine, configurations similar to the amphiasters of animal cells were observed during anaphase; similar structures were observed in untreated cells by phase contrast microscopy. It is therefore thought probable that plant cells possess a centriole. During the first metaphase of meiosis in the hybrid *Solanum antipoviczii* x *S. chacoense*, two chromosomes were observed to be left behind; in the second metaphase these chromosomes formed a separate spindle. This indicated that every chromosome may contribute to the formation of the spindle and it was also considered possible that each chromosome is attached to a component of a centriole.

2578 Ôta, T.
Division of the generative cell in the pollen tube.
Cytologia, Tokyo 1957 : **22** : 15–27.

Using *Allium odorum, Thea sinensis* and five other species of angiosperms, division of the above cell was studied *in vivo* by the phase-contrast microscope and in fixed and stained preparations. Its division was essentially similar to that of other typical plant cells, although some deviations were detected, such as degeneration of the cell plate and absence of polysaccharides in this structure.

2579 Riley, H. P.
Chemical protection against X-ray damage to chromosomes.
Genetics 1957 : **42** : 593–600.

Protection against the formation of interchanges and deletions in X-irradiated onion roots was given by 4×10^{-3} M sodium sulphydrate, sodium thiosulphate, sodium hydrosulphate and sodium pyrosulphate and by 1·7 M ethanol, while 4×10^{-3} M sodium metabisulphite, cysteine and cystine gave protection against deletions but not significantly against interchanges and 4×10^{-4} M cysteine and cystine gave protection against anaphase bridges. [Cf. XXVI, 887].

2580 Ebert, M., Hornsey, S. & Howard, A.
Effect of inert gases on oxygen-dependent radiosensitivity.
Nature, Lond. 1958 : **181** : 613–16.

When hydrogen, helium, nitrogen, argon, krypton or xenon was added to the air in which roots of *Vicia faba* were exposed to X rays, the sensitivity of the roots decreased until at sufficient concentration of the gas it reached the level characteristic of anoxic conditions. The measure of radiosensitivity was the reduction in growth rate of the root, this reduction being regarded as predominantly due to death of the cell consequent upon chromosome damage. No effects of inert gases upon radiosensitivity were observed in the absence of oxygen. Similar results were obtained with cells of the Ehrlich ascites tumour of the mouse irradiated *in vitro*. The authors conclude that inert gases at high concentration are able to displace oxygen from sites within cells at which oxygen molecules can increase radiosensitivity and that such displacement occurs in cells of widely different kinds. The site from which oxygen is displaced may be a lipid-water interface within the nucleus or associated with the nuclear membrane.

2581 Read, J.
Effect of a combined treatment with 8-ethoxycaffeine and argon on the roots of *Vicia faba*.
Nature, Lond. 1958 : **181** : 616–17.

As indicated by observations on the growth rate of roots, argon pressures which completely annulled the enhanced sensitivity to X rays induced by oxygen had no effect on sensitivity to 8-ethoxycaffeine, although this sensitivity also depends on the presence of oxygen. The site of action of oxygen in influencing sensitivity to X rays therefore appears to differ from the site of action of 8-ethoxycaffeine. The writer discusses work by Kihlman on the induction of chromosome aberrations and by Ebert *et al.* [2580] in connexion with the position and nature of the site of action of oxygen.

2582 Navašin, M. S.
(Chromosomes and species formation).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 1615–34. [Russian].

The author points out the significance of the centromere for the recombination of characters; the importance of studies of chromosome morphology, started at an early date in the Soviet Union, for a knowledge of species in certain plant groups is illustrated by reference to the genus *Crepis*. It is shown how species have arisen by polyploidy, polysomy and changes in chromosome structure, various types of which are described. The importance of amphidiploidy in the origin of species in nature, pointed out by Karpečenko in the Soviet Union in 1927, has been amply confirmed. Other polyploid species are referred to as having arisen by chromosome differentiation in a natural autopolyploid; this process has been actually observed in experimental autotetraploids of kok saghyz, where the chromosome differentiation was already so high that the original tetraploids showed a large predominance of bivalents. The role of polyploidy as a factor causing isolation and hence favouring speciation is also emphasized. Cases of translocation leading to the development of forms with more or less than the original number of chromosomes are cited and it is shown how a study of such chromosome relationships can shed light on interspecific relationships, as in many genera closely related to *Crepis*. Several variants of *C. tectorum*, produced in 1935 by translocation, have remained constant since that time and differ from the initial form in just such a way as do naturally occurring forms ascribed by systematists to other genera such as *Zacyntha*, *Phaecasium* or *Pterotheca*; they are described and illustrated under the designation *C. nova*.

2583 Nakahara, K. & Komoto, Y.
The effect of high temperature on the meiotic figures of *Tradescantia paludosa*.
Cytologia, Tokyo 1957 : **22** : 1–11.

The chromosomes at anaphase I and II were the most susceptible to treatments of 30–47° C. for 5–30 min., swelling and fusion into lumps being observed. The formation of lumps as the result of treatment at anaphase or other stages often altered subsequent chromosome behaviour and the duration of division so completely that comparison with normal untreated cells was not possible.

2584 Celestre, M.-R.
Influenza del campo magnetico a polarità e regime costante* su apici radicali di *Hyacinthus orientalis* L. e *Tulipa gesneriana* L. (**The influence of a magnetic field of constant polarity and intensity on the root apices of *H. orientalis* L. and *T. gesneriana* L.**).
Caryologia 1957 : **10** : 340–51.

Stickiness and some fragments were observed after treatments of from two to three hours while longer treatments resulted in inhibition of spindle activity and the formation of chromatid bridges and free fragments. In all cases mitotic activity was reduced but some recovery occurred after about four days. Resting nuclei showed pycnosis and degeneration. [Cf. XXV, 593].

2585 Mallah [Al Mallah], G. S. & Dawood [Dawud], M. M.
Cytological studies of the effect of sodium arsenite on *Vicia narbonensis* roots.
Alexandria J. agric. Res. 1956 : **4** : No. 1 : 91–104.

Solutions ranging in concentration from 1 N to 0·000001 N were applied. At the stronger concentrations, chromosome clumping and agglutination were observed, also pseudobridges. At the weaker concentrations, c-mitoses, delay of centromere division, binucleate cells and multipolar spindles were produced.

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* Presumably "costanti."

2586 Fetner, R. H.
Chromosome breakage in *Vicia faba* by ozone.
Nature, Lond. 1958 : **181** : 504–05.

Exposure of seeds of *V. faba* to an $O_3 + O_2$ mixture (0·4% by weight O_3) for 15, 30 and 60 min. resulted in respectively 10, 29 and 42% of abnormal anaphases, as indicated by bridge formation. All the bridges were of the chromosome type, i.e. they were the result of dicentric and centric ring aberrations. No abnormal anaphases were observed in the control material, treated with O_2 only. Treatment with O_2 for 60 min., $O_3 + O_2$ for 30 min., X rays (100 r. delivered at 50 r./min.) and O_3 for 20 min. + X rays (100 r.) resulted in 0, 23, 25 and 42% of abnormal anaphases respectively.

2587 Meletti, P.
Azione mitostatica dell'acido salicilico sui tessuti adulti del fusto di *Cereus validus* Haw. stimolati alla mitosi. **(Mitostatic action of salicylic acid on adult tissues in the stem of *C. validus* Haw., previously stimulated to mitotic activity).**
Nuovo G. bot. ital 1956 : **63** : 46–60.

Partial inhibition of mitotic activity induced by 2,4-D in the ribs of the above species was obtained when a 1/16 solution of salicylic acid was injected 32 days after the mitotic stimulation.

2588 Beatty, A. V. & Beatty, J. W.
Chromosome breakage and rejoining in Tradescantia microspores.
Amer. J. Bot. 1957 : **44** : 778–83.

The oxygen effect (cf. XVIII, 89 and XXI, 821] has been found in the presence of carbon monoxide. The effect of carbon monoxide is reversible by light and operates in the presence of oxygen only on the rejoining process. It is suggested that oxygen influences the result of X irradiation in two ways, firstly during irradiation, bringing about the oxygen effect, and secondly after breakage occurs in providing energy for rejoining the breaks.

GENERAL BOTANY

2589 Bernstein, H. L.
Site of zygote formation in *Escherichia coli.*
J. gen. Microbiol. 1958 : **18** : No. 1 : viii–ix. (Abst.)

No consistent relationship was found between mating type and donor or recipient capacity. It was also noted that the recipient parent did not necessarily contribute the majority of unselected genetic markers.

2590 Kimura, K.
(Nuclear compatibility following diploidisation involving double compatible conjugation in the Hymenomycetes).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1957 : **70** : 391–95.

The tetrapolar species *Coprinus macrorhizus* f. *microsporus* was used, and small diploid mycelia were inoculated at the edge of large haploid cultures. In all combinations one of the nuclei of the diplont was of the same origin as that of the haplont while the other differed; assuming combinations were of the form $A^1B^1 \times (A^1_2B^1_2A^2B^2)$, it was found that in many combinations, conjugation was of the type $A^1A^2B^1B^2$ but in others of the type $A^1A^1_2B^1B^1_2$. It is suggested that nuclear affinity is controlled by modifiers.

2591 Modylevs'kyj, Ja. S.
(The process of fertilization in angiosperms, or how "somatic fertilization" should not be defended).
Ukrajin. bot. Ž. 1957 : **14** : 86–98. [Ukrainian].

Oksijuk, P. F.
(A few more remarks about the so-called somatic fertilization in plants).
Ukrajin. bot. Ž. 1957 : **14** : 99–104. [Ukrainian].

Both writers criticize an article by Zajkovs'ka [XXVII, 3732] and state that the evidence offered in support of the theory of somatic fertilization was based on imperfect technique.

2592 Pandey, K. K.
Genetics of self-incompatibility in *Physalis ixocarpa* Brot.—a new system.
Amer. J. Bot. 1957 : **44** : 879—87.

Two completely self-incompatible plants were crossed reciprocally. The family derived from one direction of the cross consisted of two intrasterile and interfertile groups. The family from the reciprocal comprised five intrasterile groups. Some of the intergroup crosses within this family were compatible while others were incompatible, reciprocal differences being found in some cases. In order to explain these results the following hypothesis is suggested. Incompatibility is determined by two independently segregating loci, *S* and *Z*, each multiple allelic. Pollen reaction is under gametophytic control, and in both the pollen and style the action of the alleles at the two loci may be independent or affected by epistasis. A pollen grain is incompatible when either one or both of the genes it carries are also present in the style. Colchicine-induced tetraploids of several genotypes were self sterile.

2593 SAMPSON, D. R.
The genetics of self-incompatibility in *Lesquerella densipila* and in the F_1 hybrid *L. densipila* x *L. lescurii*.
Canad. J. Bot. 1958 : **36** : 39–56.

Self incompatibility in the cruciferous genus *Lesquerella* proved to be controlled by a series of multiple *S* alleles at one locus, the pollen reaction being determined sporophytically. Two types of allelic relationship, independence and dominance, were detected in heterozygotes. Of the nine alleles which acted independently of one another in the stigmas, four were dominant over the remaining five in the pollen.

2594 STRAUB, J.
Das Überwinden der Selbststerilität. (**Overcoming self sterility**).
Z. Bot. 1958 : **46** : 98–111.

The genetical basis for the type of self sterility which involves inhibition of the growth of pollen tubes is described. Methods of overcoming self sterility by obtaining new combinations of genes are outlined and some hitherto unpublished work is mentioned. Stecher obtained polyploids of self-sterile *Petunia hybrida* carrying the gene combinations $S_1S_2S_3$ and $S_1S_2S_3S_4$; pollen carrying only the S_1 gene was able to grow unhindered through the style of both polyploids. Diploid pollen tubes (S_1S_1) were able to grow to the base of styles of diploid plants homozygous for S_1; the diploid pollen is thought to have more of the substances necessary for the growth of the pollen tubes than haploid pollen. Triploid plants ($S_1S_3S_4$) were crossed with diploids and gave some trisomic progeny, which on selfing produced a certain number of self-fertile diploids, some of which apparently had no *S* genes.

Other experiments mentioned include overcoming self sterility by removing part of the pistil before pollination, pollinating an unripe stigma, applying low temperatures to slow down the inhibitory reaction and using up the inhibitor in the style by repeated self pollination.

2595 RICH, A.
Formation of two- and three-stranded helical molecules by polyinosinic acid and polyadenylic acid.
Nature, Lond. 1958 : **181** : 521–25.

Synthetic analogues of RNA have been prepared which (1) exhibit a 2-stranded helical structure involving one molecule each of polyadenylic acid and polyinosinic acid or (2) a 3-stranded helical arrangement in which one molecule of polyadenylic acid is matched with two molecules of polyinosinic acid.

2596 DE, D. N.
Pollen tube mitosis without culture medium: metaphase arrest by acenaphthene.
Stain Tech. 1958 : **33** : 56–57.

The use of acenaphthene vapour for 24 hr. at 20–22° C, followed by staining with acetocarmine is recommended. If the germinating pollen tubes are placed on a clean slide in a moist chamber during the treatment they adhere to the slide and may be fixed, dehydrated and embedded in methacrylate for sectioning for electron microscope studies.

2597 STEFFEN, K. & LANDMANN, W.
Chondriosomen-, Sphärosomen- und Proplastidenzahlen in Beziehung zu den Differenzierungsvorgängen bei der Antherenentwicklung. (**The numbers of chondriosomes, spherosomes and proplastids in relation to the processes of differentiation in the development of the anther**).
Planta 1958 : **51** : 30–48.

Information is provided on changes occurring in the numbers of the above organelles in archespore, pollen mother and tapetal cells during anther development in *Impatiens glandulifera*; changes in the RNA content of tapetal and pollen mother cells are also mentioned. The findings are considered in relation to problems of cell differentiation, reference being made to the views of Michaelis on plasmon recombination [cf. XXVII, 1050].

CROP PLANTS

2598 TORMANN, H.
Blindversuche in Feldbeständen von Futterrüben und Winterweizen als Beitrag zur Feldversuchsmethodik. (**Uniformity trials in field stands of mangels and winter wheats as a contribution to field-trial methods**).
Albrecht - Thaer - Arch. 1958 : **2** : 316–17.

Information on limiting significant differences in uniformity trials of wheat and mangel using different layouts is presented. Later work along the same lines has already been summarized [XXV, 639].

2599 Sváb, J.
A nagyüzemi fajtakísérletek módszerei. (**Methods for large-scale varietal trials).**
Agrártudomány 1957 : **9** : No. 9 : 1–7.

[Cf. 2611].

2600 D'Amato, F.
Il campo d'irradiazione gamma del Brookhaven National Laboratory a Upton (U.S.A.). [**The gamma-irradiation field of the Brookhaven National Laboratory at Upton (USA)**].
Caryologia 1957 : **9** : 353–65.

The work of this well-known irradiation field is described and some of the results obtained briefly mentioned.

2601 **Committee for Colonial Agricultural, Animal Health and Forestry Research, Twelfth Annual Report.**
Colonial Research 1956–1957. HM Stationery Office, London, 19–129.

The report includes brief accounts of the chief projects being carried out on crop breeding in the different countries served by the Colonial Research Council of the British Commonwealth. Most of the work in progress has already been referred to in *Plant Breeding Abstracts*.

The Research and Experimental Record of the Ministry of Agriculture, Northern Ireland 1956 (1957) : **6** : Pp. 233.

2602 *Wright, C. E. Blind seed disease of ryegrass I, II, III.* (*pp. 1–18*).

Mention is made in the first of these papers to differences found between strains of *Lolium perenne* with regard to their disease reaction when naturally infected while the second paper describes a technique developed for the preliminary mass screening of a large volume of material. In the third paper tabulated data are provided showing the average infection, in 1955, of 31 varieties and strains naturally infected in the field. A strong negative correlation was found between mean ear emergence in ryegrass strains and their degree of infection by *Phialea temulenta* but interseasonal and intersite variation in the onset and duration of sporulation in the pathogen was so wide as to cast doubt on the advisability of breeding for a flowering period separated in time from the period of peak ascospore production.

2603 *Proudfoot, K. G. A comparison of total dry-matter yields obtained in the first harvest year, from five strains of perennial ryegrass under single plant, pure sward, and clover sward conditions.* (*pp. 19–30*).

"Strains were ranked similarly under both pure and clover-sward conditions but, when assessed as single plants, where basal development was unrestricted, this order was not maintained. The discrepancy tended to disappear when single plant production was related to the actual area occupied. It is suggested that the use of the yield/basal diameter ratio in strain classification will give a more accurate picture of potential yield under sward conditions."

2604 *Morrow, J. W. Ryegrass isolation studies in Northern Ireland.* (*pp. 31–35*).

"Studies under conditions prevailing in Northern Ireland have produced results which are in general agreement with those of Wit [XXIII, 394] and Griffiths [XXI, 1895] regarding the relative effects of isolation distance, and border rows, in reducing contamination by foreign pollen."

2605 *Proudfoot, K. G. & Wright, C. E. An assessment of the suitability of Oregon perennial ryegrass to Northern Ireland conditions.* (*pp. 36–44*).

Both strains of Oregon ryegrass proved inferior to the four British strains tested with them.

2606 *Robinson, D. W. The barn storage of apples in polythene bags.* (*pp. 65–76*).

The use of polythene bags for storing apples is affected by the susceptibility of the variety concerned to carbon dioxide injury or scald. Tabulated data are included showing the weight loss, percentage of brown heart, percentage scald and percentage rot, due mainly to *Gloeosporium*, of a number of apple varieties stored in different ways.

2607 **Twenty-eighth Annual Report of the University of Birmingham Research Committee, 1956–1957** (1957) : Pp. 107.

The Department of Botany reports that pathogenicity tests with isolates of *Phytophthora fragariae*, using six strawberry varieties, show the presence of 12 races of the pathogen.

Studies on species relationships in tuber-bearing *Solanum* species continue and serological studies of Mexican potatoes have been used to distinguish three well-defined species groups which are genetically isolated from each other by sterility barriers. Pachytene analyses in *Solanum* and *Lycopersicon* have shown that only two chromosomes can be distinguished with certainty from cell to cell or traced from one species to another. Comparisons of metaphase chromosomes of naturally occurring and synthetic *Solanum* polyploids have been undertaken in an attempt to trace their mode of origin.

Gene interaction has been one of the subjects of study of the Department of Genetics and means by which interactions between genes and environment can be represented have now been formulated [XXV, 2625 and XXVII, 1064]. It has been found that hybrid vigour may be brought about by a variety of genetic mechanisms, of which interaction between unlike genes is of particular interest and promise. The combined effect of gene interactions and natural or artificial selection is also under investigation and the use of the diallel crossing technique in the analysis of complex genetical situations is being developed further.

Two types of cytoplasmic variation have been found in *Aspergillus*. One, which is quantitative, appears to arise from changes in the numbers of cytoplasmic particles which multiply in the cells and are transmitted in cell division. It is important in differentiation of cells, aging and short term adaptation to environment. The second is qualitative and results from changes in the nature and properties of the individual cytoplasmic particles. These changes resemble gene mutations in their effect and can be stimulated by irradiation [XXVII, 3681].

Studies of chromosome behaviour in some interspecific grass hybrids have revealed unexpected genetic relations which are being further investigated.

The Department of Microbiology has prepared a number of new biochemical mutants of *Neurospora* with the object of studying the fine structure of the gene and the organization of biochemical functions in the cytoplasm.

"The structural changes produced by γ-irradiation of DNA in aqueous solution have been studied by light scattering, electrometric titration and other methods. Degradation into smaller units occurs when two breaks are opposite to each other in the double helix; the cross linking hydrogen bonds are selectively broken."

2608 Lochow, J. v.
Aus der Werkstatt des Pflanzenzüchters. (**From the workshop of the plant breeder**).
Mitt. dtsch. LandwGes. 1958 : **73** : Illustr. Beil. **11** : No. **3** : unpaginated.

This is an illustrated popular account of the work of a plant breeder.

2609 Zusammenfassung 1957 mehrjähriger Versuchsergebnisse von Getreide, Mais, Kartoffeln, Rüben, Luzerne, Rotklee. (**Summary of the results of several years' trials of cereals, maize, potatoes, beets, lucerne and red clover, 1957**).
Bundesanst. Pflbau. Samenprüf., Wien 1958 : Pp. 32.

Results of varietal trials of the above crops at different centres in Austria are summarized in tabular form.

Nemesített növényfajtákkal végzett országos fajtakísérletek eredményei 1956. (**The results of national varietal trials of improved crop varieties, 1956**). 1957 : Pp. 233.

2610 *Jánossy, A. Az Országos Növényfatjtakísérleti Intézet 1956. évi működése.* (*The activities of the National Institute for crop Variety Testing in 1956*). (*pp. 3–19*).

Notes on the trials in progress at the above Hungarian station are presented, together with information on varieties of cereals, potato, mangel, turnip, flax, hemp and forage legumes which have done particularly well.

2611 *Sváb, J. Nagyüzemi fajtakísérletek módszerei.* (*Methods of conducting large-scale varietal trials*). (*pp. 34–44*).

On the basis of large-scale trials carried out on various farms in Hungary the following conclusions are drawn: (1) it is best to use large plots between 3–6 ha. and 10–15 ha.; (2) one single plot of this size for each farm appears to be most suitable; and (3) where row crops are compared a greater number of farms is required for the same differences in yield to reach significance than is the case with broadcast crops. A diagram relating significant differences to numbers of farms is included.

2612 *Hinfner, K. Burgonyafajták cérnahajtásképződése az 1953–55. évi országos kisérletben.* (*The development of spindling sprout in potato varieties in the 1953–55 national varietal trials*). (*pp. 48–66*).

Tendency to develop spindling sprouts was a varietal characteristic, midlate and late varieties being most resistant. No causal organism could be identified; the disorder was most severe in heavy soils.

2613 *Papp, Zs. Őszi búza* (Triticum aestivum *f.* hybernum *L.*). [*Winter wheat* (T. aestivum *f.* hybernum *L.*)]. (*pp. 67–91*).

In trials conducted in 1954–56, involving 17 wheats, Kompolt F169 continued to give good yields but was unsatisfactory in milling quality; an improved strain of this variety has shown promise in a preliminary trial. Other promising strains undergoing preliminary trial include Karcag 522, Karcag 612 and B8000, which have outyielded standard varieties, and the rust-resistant variety Fertőd 293.

2614 *Horváth, P. Őszi árpa* (Hordeum hexastichon *L.*). [*Winter barley* (H. hexastichon *L.*)]. (*pp. 92–103*).
Details of the performance of four varieties tested from 1954 to 1956 at 12–15 localities in Hungary are reported. Preliminary results of a further trial set up in 1955 of four new varieties and two standards are also presented.

2615 *Sváb, J. Amerikai "Pioneer" hibridkukoricákkal végzett kisparcellás fajtakísérletek.* (*Small-plot varietal trials of American Pioneer maize hybrids*). (*pp. 104–24*).
Twelve American hybrids of the Pioneer group, two Hungarian hybrids and one varietal cross were tested at six localities in 1956. Significant variety x locality interactions in ear and dry grain yield were found, with marked differences between localities lying east of the Tisza river and those to the west of the Danube. Differences between the varietal yields in the two regions appeared to result entirely from differences in ear number per plant, the American hybrids showing greater fluctuations in this character than the Hungarian.

2616 *Schüller, F. Amerikai kukoricafajtákkal végzett nagyüzemi kísérletek.* (*Large-scale trials of American maize hybrids*). (*pp. 125–49*).
Data are presented on the performance of 12 American hybrids of the Pioneer group, the Hungarian hybrid Mv5, the intervarietal hybrid Ó5 and a number of local Hungarian varieties in trials conducted in 1956 on farms throughout Hungary. The American hybrids were highly productive but suited to warmer districts only; Mv5 was more widely adapted.

2617 *Horváth, A. Cukorrépa* (Beta vulgaris *v.* saccharifera *Alef.*). [*Sugar beet* (B. vulgaris *v.* saccharifera *Alef.*)]. (*pp. 151–75*).
Three-years' trials held in 1954–56 are summarized. As in preliminary results [cf. XXVII, 2589 and 2603), Poly Beta 1 and 3 again excelled in yield. They also showed less variability under differing climatic conditions than introduced varieties.

2618 *Csák, Z. Lucerna fajtakísérletek 1953–1956* (Medicago sativa *L. és* M. varia *Martyn*, M. media *Pers.*). [*Lucerne varietal trials, 1953–1956* (M. sativa *L. and* M. varia *Martyn*, M. media *Pers.*)]. (*pp. 176–83*).
In trials of 10 varieties at 10 stations the local variety Nagyszénás was highest in yield.

2619 *István, K. Csemegepaprika* (Capsicum annuum *L.*) *1955–56.* [*Sweet pepper* (C. annuum *L.*), *1955–56*]. (*pp. 184–207*).
Details of the performance of 13 varieties both in the open and under glass are presented, together with information on canning quality.

2620 *Gábriel, A.* (*Mrs.*). *Késői fejeskáposzta* (Brassica oleracea *var.* capitata *L.*) *1954–55–56.* [*Late cabbage* (B. oleracea *var.* capitata *L.*) *1954–55–56*]. (*pp. 208–17*).
The results of trials of some local Hungarian and two introduced varieties are reported.

2621 *Vigh, L. Cukordinnye* (Cucumis melo *L.*) *1956.* [*Melon* (C. melo *L.*), *1956*]. (*pp. 217–32*).
Preliminary results are given of a trial established in 1956, involving 9 Hungarian, one Bulgarian and 13 French varieties.

Proceedings of the First Meeting of the Hungarian Biological Society, Budapest, April 26–28th, 1956.
Acta biol., Budapest 1957 : Suppl. 1 : Pp. 52. (Absts.).

2622 *Sedlmayr, K. Biological research in the Institute for Plant Breeding and Growing at Sopronhorpács.* (*p. 7*).
Work at the above institute includes studies of the nature of *Cercospora* leaf-spot resistance in sugar beet, selective fertilization in mangels and sugar beet and the physiology and morphology of polyploid beets.

2623 *Daniel, L. On the inheritance of the four-rowed character of ears in maize.* (*p. 45*).
[Cf. XXVII, 2939].

2624 *Pazonyi, B. Investigations into mutations obtained from the yeast* Rhodotorula glutinis. (*pp. 45–46*).
Eleven colour mutants obtained after ultraviolet irradiation lasting 90 or 105 seconds did not differ in nutritional requirements but showed some differences in carotenoid constituents.

2625 *Kiss, Á. & Rajháthy, T. Crosses within the Triticinae group. (pp. 46–47).* [Cf. XXVI, 374].

2626 Stazione Agraria Sperimentale, Bari. Relazione sull'attività della Stazione nel decennio 1947–56. (**Agricultural Experiment Station, Bari. Report on the work of the station in the period 1947–56**). 1957 : Pp. 161.

In addition to information on variety trials with flax, cotton and other fibre plants, and with tomatoes, the following results are reported.

Wheat. By selecting among crosses of the hard wheat Cappelli certain lines combining the qualities of this variety with a reduction in the length of the second half of the developmental stage have been obtained. Hybrids of *Triticum durum* with *T. turgidum* have been made with the object of producing a true late-early type of hard wheat (cf. XXVII, 2613]. The bread wheat Maiorica 47, which is of the early-late type, has proved successful in cultivation in southern Italy but the most useful of all are the late-early types such as Elia, M5 and S. Pastore; crosses to produce more varieties of this type are being investigated.

Maize. Under irrigation, yields of grain exceeding those of the local varieties by up to 77% have been obtained from hybrids such as Wisconsin 355 and Wisconsin 641, and without irrigation early hybrids such as U3 have exceeded the local varieties by over 100%.

Forage crops. Two cultivars of *Vicia sativa*, one for the hills and one for the plains, have been produced; also two of *V. faba*.

Lucerne types of varied provenance have been studied and those that have displayed the most suitable rhythm of growth for the conditions of southern Italy are mentioned; others are distinguished by resistance to cold or to various fungous diseases.

Populations of *V. faba* ssp. *major* from Puglia are being studied on account of their high tillering capacity, seed yield and tolerance of adverse climatic conditions.

Selection is being carried out also on *Lathyrus* spp., *Cicer arietinum* and other leguminous species.

Sugar beet. In autumn sowing without irrigation the varieties Cesena NSA and Klein AA have shown the lowest degree of bolting.

Almond. Seedlings of several local varieties are being studied with the object of selecting forms with a higher kernel percentage than 25%, which is the average for the almonds of the Puglia region, and a number of crosses have been undertaken for the same purpose.

Hybrids of almond x peach have displayed extreme vegetative vigour but are susceptible to *Exoascus deformans*.

Studies of fruit set have shown the varieties Tuono [Thunder], Genco, Occhiorosso [Red-eye] and Barese [almond from Bari] to be self-fertile. Intervarietal pollinations gave sets varying from 0 to over 40%, the best being Mollese tonda [Round Mollese] x Filippo Ceo. In general the variety Mollese proved one of the best pollinators. Good sets were obtained in crosses with peach and apricot pollen but none from plum.

Pollen at 4° C. with humidity of 30% has been kept successfully for 50 days.

A scheme for the description of almond cultivars has been elaborated [cf. 2170].

Olive. Studies on the fertility of the olive cultivars of the province of Bari are reported, two cultivars being named as having a high degree of self fertility, Paesana [Peasant] with 1·6% and Correggiolo with 1·1% over a four-year period. The variety Cellina di Nardò proved the best pollinator, giving sets of up to 3% when used to pollinate varieties such as Coratina.

Crosses have been made between a number of promising cultivars and about a million seeds of the variety Coratina from different zones have been sown for a thorough study and later use as a basis of selection.

Vegetables. Five promising lines of Trocadero lettuce and three of endive have been selected.

2627 Estación Experimental de Aula Dei. Departamento de Mejora. Ensayos 1956–1957. (**Aula Dei Experimental Station. Department of Breeding. Trials, 1956–1957**) : Pp. 18. (Mimeographed).

Data are given on the results of yield trials of wheat, barley and oats on irrigated and unirrigated land. Among new wheats for irrigated land, F_7 lines of the cross L–4 x Hope, effected with the aim of combining the lodging resistance of the first parent with the spike characters and rust resistance of the second, have surpassed both parents and slightly outyielded Pané 247. The reactions of 39 resistant to highly resistant wheats to *Puccinia glumarum*, *P. rubigo-vera* and *P. graminis* are listed.

Varieties of grasses, legumes and *Sanguisorba minor* of varying provenance have been studied with respect to growth cycle, hardiness and hay production.

The results of trials of selections of vetch and soya bean are included.

2628 Instituto Nacional de Investigaciones Agronómicas. Memoria de los trabajos realizados 1955–1956. (**National Institute of Agricultural Research. Report of work carried out in 1955–56**) : 1957 : Pp. 215.

The report prepared by the Spanish national committee to the 8th FAO Conference contains the following items connected with plant breeding, in addition to reports of variety tests with various grasses, leguminous forage plants, soya beans, sugar cane and sweet potato.

Wheat. Studies on milling and baking quality and chemical composition have been carried out on a number of varieties.

The collection and classification of the Spanish wheats has continued and been supplemented by a collection of some 500 wheats from other countries too. The collection has been studied for reaction to smut in order to find a resistant parent as similar as possible in type to Aragón O–3 with the object of transferring smut resistance to this variety. From crosses of such resistant forms with Aragón O–3, followed by back crosses to Aragón O–3, several promising resistant forms have been produced; some resemble Aragón O–3 in type and have been named Aragón sin Tizón 35 [Smut-resistant Aragón] and Aragón sin Tizón 36; others are different in type but are well adapted to conditions in different parts of Spain. Other new varieties are San Rafael (Aragón O–3 x Hâtif inversable [Early Lodging-resistant]), which exceeds Aragón O–3 in yield and standing capacity and is suitable for moist or irrigated soils; Magdalena (Aragón O–3 x Marquillo), which is resistant to yellow rust and suitable for cool areas and excellent in baking quality; and Aureo 22 and Aureo 23 (Aragón O–3 x Oro [Gold]), which are resistant to cold, yellow rust and drought.

Observations on wheat hybrids in various generations have confirmed the superiority of Aradi in the northern plateau and Canaleja in the Mancha [cf. XXVII, 2751]. Good results have been given also by Canti (Candeal Alcalá x Rieti 11), Saria (Riale x Pusa 4) and Floreal (Candeal Sagra x Florence Aurore 588).

Trials of varieties of *T. aestivum* and *T. durum* have been carried out in different parts of the country.

Investigations on the physiological races of cereal rusts have shown *Puccinia graminis* var. *tritici* races 21, 24, 17 and 14 and *P. rubigo-vera* var. *tritici* races 4, 84, 26 and 67 to be the most common in Spain. The reaction of 210 hybrids of *Triticum aestivum* has been studied, showing several of them to be resistant to race 14 of *P. graminis* and certain others resistant to race 21. Varieties resistant to races 21, 4 and 84 were found among the wheat collection; varieties displaying mature-plant resistance to races 17 and 21 and an unidentified race referred to as A were Kenya C9724, Newthatch and *T. timopheevi* var. *viticolosum.*

Oats. A collection of 1694 Spanish and foreign varieties has been examined and 15 selections, now being tested, have been made from it. The varieties best suited for different parts of the country are indicated.

Rye. Selection for self fertility has been pursued with the aim of obtaining selfed lines of high combining ability. Crosses have been made with *Secale cereale* var. *clausopaleatum* with the object of obtaining lines with greater freedom from shedding and lodging.

Wheat x rye crosses have been made with and without embryo grafting; of the 180 grains obtained only 70 germinated; the seedlings were treated with 0·05 colchicine solutions and 34 *Triticale* hybrids have been produced. From a further set of crosses 840 hybrid grains have been obtained and will be subjected to colchicine treatment too.

In experiments on induction of mutations by the use of P^{32} a number of chromosome breaks have been produced and a high degree of sterility has resulted; two plants with branched ears have been produced in this way.

Maize. A collection of 131 Spanish, 70 other European and 108 American varieties is under observation, together with some 1000 selfed lines in generations varying from F_1 to F_{12} and a larger number of hybrids. Of the double crosses so far tested, 5% have proved worthy of introduction into general cultivation. Selfed lines have been provided to seed firms for the production of open-pedigree hybrids such as Ohio M–15, Indiana 620A, Indiana 419A, Indiana 620C, US13 and Kansas 1859.

Barley. A collection of 2204 barleys comprising collections from different parts of Spain and some from elsewhere has been studied and selections have been made from the most promising. The varieties that have given the best results in different parts of the country are enumerated.

Rice. A large collection of varieties has been classified and information procured concerning their origin.

Forage plants. Selection E-425 of lucerne is promising and is being multiplied. Introductions from France and the USA are proving better than local lucernes.

A synthetic variety referred to as *Medicago falcata* x *M. Aragón* is also proving valuable. Selection E–428 of *Vicia villosa* and a white-flowered selection from La Moncloa are distinguished by large seeds.

Potato. Cytological studies have been made on a number of primitive species of *Solanum* and hybrids of the following species have been obtained: *S. jamesii* x *S. pinnatisectum* F_1 and F_2; *S. jamesii* x *S. lanciforme*; *S. pinnatisectum* x *S. ehrenbergii*; *S. lanciforme* x *S. ehrenbergii*; *S. sambucinum* x *S. ehrenbergii*; and *S. sambucinum* x *S. lanciforme*. No hybrids of these species with members of the series *Tuberosa* have been obtained.

Crosses have been made between a number of domestic varieties and Katahdin and Oberarnbacher Frühe [Oberarnbach Early], which were found to be the best pollen varieties. The seedlings are being selected for earliness and resistance to drought and frost. The most promising drought-resistant seedlings were found in the crosses Ackersegen x Katahdin and Ackersegen x Pedro Muñoz. Some promising frost-resistant clones have been produced in back crosses of hybrids of *S. acaule* and *S. simplicifolium* with domestic potatoes.

Ten varieties from the Canary Isles have been examined, seven of them having shown affinities with *S. andigenum* and one being a triploid.

Rubber plants. As a result of over five years of selection in kok saghyz the rubber content in the dry matter has been raised from 14% to over 30% and in several parts of Spain it should soon be possible to produce yields of 400 kg. of rubber per ha.

Olive. Observations have been made on a collection of 48 cultivars from different parts of Spain and on the progeny of 16 of them, from which 66 selections have been made.

Vine. Selection for vigour and resistance to *Phylloxera* is being carried out on a number of rootstocks.

Selfing for four generations has been effected on a number of vines from the Rioja region; 210 crosses are under observation and efforts are being made to procure improved varieties of both wine and dessert grapes by producing polyploids.

Chestnut. Of 240 hybrids selected for resistance to *Phytophthora cinnamomi* several are mentioned as especially promising. These include several hybrids of *Castanea sativa* x *C. crenata* var. *tamba*, which are vigorous, root well or possess good affinity with the best cultivars; hybrids of the local chestnuts with *C. koreiensis* and *C. mollissima*; a hybrid of uncertain origin, probably *C. crenata* x *C. mollissima*; and some hybrids of *C. sativa* x *C. crenata* var. *tamba*, or the reciprocal, distinguished by earliness and good yield and quality of fruit. Some of the F_2 hybrids are also considered promising.

2629 Suščevskij, M. G.
(The Krasnyj Kut Breeding Station among the exhibitors at the All-Union Agricultural Exhibition).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 5 : 29–33. [Russian].

Descriptions are given of many older varieties of crop plants bred at Krasnyj Kut in addition to those referred to below.

Wheat. Melanopus 1932, Krasnokutka [wheat from Krasnyj Kut] and Melanopus 26 are highly productive hard spring forms resistant to drought, lodging, shedding and moderately resistant to disease. Krasnokutka and Melanopus 26 have large vitreous grain.

Barley. Recent selections include Medicum 1952 which has tall firm straw and outyields the standard varieties by 1·7–2·5 c. per ha.

Camelina. Zavolžskij [Trans-Volga] is productive, hardy, and resistant to pests, diseases, lodging and shedding. It has an oil content of 39·4% and matures early and uniformly. In ten years its mean yield was 9 c. per ha.

Chickpea. Mention is made of (1) Skorospelka [Early] and Severnyj 2 [Northern 2], distinguished by vigour and early maturity, (2) Jubilejnyj [Jubilee], a tall productive bush type suitable for combine harvesting, and (3) the drought-resistant Krasnyj Kut 195 which is productive of large peas of good cookability and flavour and rich in protein.

2630 Sizov, I. A.
(Utilizing heterosis for improvement of the yield of agricultural crops).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 5 : 34–38. [Russian].

The Mičurinist thesis that physiological differentiation of parental forms grown in different environments is responsible for heterosis is outlined and explanations of heterosis based on formal genetics are rejected. The writer advocates the production of heterotic hybrids of other plants besides maize. He believes that induction of heterosis would be especially valuable in perennial plants and vegetatively reproduced plants, there being no need for annual reproduction of F_1 seed. In this connexion mention is made of two heterotic hybrids of the raspberry Marlborough and of two hybrids of the strawberry Madame Moutot, all obtained by multiparental pollination in Bulgaria. The difficulties of controlled hybridization of buckwheat, rye and other wind or insect-pollinated plants are referred to. At the Institute of Plant Industry these appear to have been overcome, for heterotic hybrids of buckwheat and rye are now said to be available. Other F_1 hybrids showing remarkable heterosis for yield include a swede (Krasnoe Selo x Vyšegorodskaja) and an indoor cucumber (Klinskij x Leningradskij Tepličnyj 23 [Leningrad Hothouse 23]).

2631 BUDJUK, V. P.
(Improve the work on varietal testing).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 5 : 78–80 [Russian].

A brief account of a conference dealing with varietal testing of wheat, maize, sugar beet, sunflower and other crop plants in the USSR is given. Mention is made of approved wheat varieties, among them 8 hard wheats which are rich in protein and have good macaroni properties and 14 strong-floured wheats, of which 7 were spring and 7 winter varieties.

(Proceedings of the VIth extended Session of the Scientific Council of the Scientific Research Institute of Arctic Agriculture, Animal Husbandry and Industry).
Leningrad, 1954 : No. 3 : Pp. 207. [Russian].

This symposium comprises reports submitted to the 1953 conference, including some dealing with the introduction, acclimatization and breeding of grasses, leguminous forage plants and vegetable crops, including the potato, in the subarctic regions of the USSR.

2632 *Ivanovskij, A. I.* (*The sowing of herbage in the Far North*). (*pp. 68–82*).

An account of breeding grasses and leguminous forage plants adapted to cultivation in the subarctic regions is given. The methods include open intervarietal pollination and sowing the hybrid seed so obtained in districts lying appreciably further to the north. Seed of timothy and wild Pečora clover was obtained in this way at Hanty-Mansijsk and is now being subjected to directed training at Turuhansk and other places in the Far North. Early observations on the development of the clovers in the new environments suggest that the Pečora clover has greater value as a ♀ parent than as pollinator for crossing with Krasnoufimsk 822, Gorno-Altajsk, Kondinskij Mestnyj [Local Kondinskoe] or the Permj land race.

2633 *Bukasov, S. M.* (*The problem of hardiness of the potato*). (*pp. 83–95*).

This report on breeding potatoes for frost resistance includes the writer's observations on the relative breeding value of diverse genetic stocks, interrelations between hardiness and environment and graft hybridization. Frost resistance was found in the cultivated species *Solanum curtilobum* and several wild species, notably *S. demissum*, *S. punae*, *S. schreiteri* and *S. depexum*. Of these, *S. demissum* gives the least hardy hybrids, but imparts resistance to *Phytophthora* which is absent in the hybrids of the other species. Some hybrids appear to possess a fair degree of frost resistance, even after continued hybridization with *S. tuberosum*. This is the case with hybrids 326 (Cobbler x *S. demissum* x Gloriosa x Katahdin x Earlaine), and 322 and 350 (both from Doon Pearl x *S. demissum* x Gloriosa x Katahdin x Stärkeragis). The difficulties resulting from crossing the wild species of the section Acaulia with *S. tuberosum* are many, in particular the low degree of compatibility between the parent species, the dominance of the wild parents and the variability of the F_1 with regard to frost resistance. Reported instances of F_1 and F_2 hybrids being uniform in frost resistance are connected with the presence of unreduced gametes of the wild species. Mention is made of the F_1 of Epron x *S. depexum* x *S. schreiteri*, which withstood — 4°C. for 12 hr. without any harmful effects and yielded 50% as well as the standard variety; whether further hybridization with domestic varieties will result in an improvement of productiveness is uncertain. It is thought that graft hybridization is a more effective means of shattering the hereditary constitution of the wild species than sexual hybridization alone. Some hybrids combining a high degree of frost resistance, earliness and moderate yield and size of tubers have already been obtained by this method. They include Hybrid 9/80 (Katahdin seedling/*S. punae* x Earlaine x mixed pollen of *S. tuberosum* varieties), and hybrid 82 [Earlaine seedling/F_1 (*S. punae*/Earlaine)] x Katahdin. Hybrid 82 is hardier than Hybrid 9/80, but the latter is more productive. Both of them outyield the standard variety. Most of the frost-resistant hybrids have a long growth period and this usually results in a reduction in tuber yield. This is the case in most interspecific hybrids of *S. curtilobum*, including the variety Hibinskij

Morozostojkij [Hibiny Frost-resistant] and hybrids 32/102 (Epicure x *S. curtilobum*) and 675 (Epicure x *S. curtilobum* x Katahdin). Hybrid 32/102 yields 78% of the standard variety when dug at the same time, but it has a 4% higher starch content and its dry-matter yield is 25% higher.

2634 *Zvereva, P. A.* (*The results of breeding work with the potato at the Salehard Agricultural Research Station*). (*pp. 96–103*).
This account of breeding work with potatoes mentions hybrids obtained by interspecific vegetative-sexual hybridization. Some are highly productive of tubers and withstand a temperature of − 6·5° C. and a few hybrids contain demissin, which is held to indicate resistance to Colorado beetle. Some hardy material such as seedlings 12–9u and 12–11u form smallish tubers under Salehard conditions, but it is thought that they may give larger tubers in more southerly districts. Seedling 2–7 has reached the advanced trial stage [cf. XXII, 1243].

2635 *Kardo-Sysoeva, E. K.* (*Ways and means of physiological and biochemical investigations of starch content and hardiness of the potato in the Far North*). (*pp. 117–26*).
Physiological and biochemical research that is likely to promote the breeding of potatoes for improved frost resistance and increased starch content in the northern districts of the USSR is discussed.

2636 *Trulevič, V. K.* (*The results of scientific research with vegetable crops grown in the open*). (*pp. 127–55*).
Tul'ženkova, F. F. (*The results of scientific research and a general account of an experiment on growing vegetables under screens in the Far North*). (*pp. 156–77*).
[Cf. 2307].

2637 Muhin, N. D.
(The fruits of creative work by the breeders of White Russia).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 5 : 23–29. [Russian].

Cereals. Among the results of breeding work are wheats and barleys suited to different kinds of soil. The winter wheat Lutescens 1866 is mentioned for its productiveness and hardiness and new spring wheats for high yields and freedom from lodging; one of them, Minsk, has good baking quality.

Lupin. Sweet lupins have been selected; also a persistent form which is productive of forage without requiring resowing for a period of 5–8 years. It was selected from wild material.

Potato. Early, midseason and late varieties resistant to *Synchytrium* have been selected.

Pea. New varieties from the White Russian Breeding Station outyield Capital by 10 c. per ha. These include Belorusskij [White Russian], an early variety which is suitable for cultivation on reclaimed bog.

2638 Šalaev, M. S. & Šer, B. L.
(The successes in breeding and seed production in the Ukraine).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 5 : 10–16. [Russian].

Winter wheat. Odessa 3, Veselyj Podol 499 and Belaja Cerkov' 198 have yields of the order of 35–40 c. per ha. and are more productive than the older Ukrainian varieties. Belaja Cerkov' 198, while outyielding such varieties as Lutescens 17, Erythrospermum 15 and Lesostepka 75 [Woody Steppe 75], also surpasses them in baking quality.

Maize. New varieties and hybrids with appreciably higher grain and forage yields than Har'kov 23 are mentioned.

Sugar beet. Verhnjačka 020 and Verhnjačka 038 have a 0·5–1·0% higher sugar content than the common varieties and produce 0·1–1·5 c. more sugar per ha.

Sunflower. Armavir 3497, VNIIMK 6540 [Oil Plants Institute 6540] and VNIIMK 1646 have a 5–6% higher oil content than Ždanov 8281, which they now supersede.

2639 Arbetsplan för Weibullsholms Växtförädlingsanstalt för år 1957. **(Plan of work for Weibullsholm Plant Breeding Institute for the year 1957)** : Pp. 46.

Arbetsplan för Weibullsholms Växtförädlingsanstalt för år 1958. **(Plan of work for Weibullsholm Plant Breeding Institute for the year 1958)** : Pp. 43.

In addition to the work reported below, information is given on current breeding aims and the programme of work for 1958 in wheat, rye, forage legumes and grasses, linseed, broccoli, Brussels sprouts, melon, parsnip, *Capsicum*, radish, celery and spinach.

Oats. Breeding aims include stiff straw, large grains and disease resistance, Swedish and introduced varieties as well as wild species being used as parents.

Barley. Numerous crosses made with the aim of obtaining very early two-rowed varieties suitable for northern Sweden have been effected among the early varieties Tammi, Asplund and Edda and the high-yielding types Rika and 5045 [Maja x (Hanna x Svanhals [Swan's Neck]) x Opal]. Breeding for straw stiffness and disease resistance in malting barleys and fodder barleys and for quality in fodder barley is also in progress. Breeding material has been exposed to X rays and neutron irradiation. Numerous crosses and back crosses involving Binder, Opal, Kenia, Isaria, Balder and others are being studied. Line 5425 from Balder x (Binder x Opal) has exceeded Herta and Rika in both yield and straw strength, and very tough straw has also been found in the sister variety 5573 and in 5492 from (Binder x Opal) x (Balder x Kenia).

Timothy. The selection Weibulls T41, which yields well and shows good aftermath growth, is being multiplied for release.

Red clover. The strain WR11 is early and hardy and shows good aftermath growth, especially in the second year. Extensive work on tetraploid material is under way.

Root crops. In breeding mangels and sugar mangels, crosses have been effected between Barres, Särimner, Bacon and sugar beets.

Crosses among the swedes Bangholm, Drottning [Queen], Balder, Östgöta, Wilhelmsburg and Criwen and among the turnips Bortfeld, Tellus, Rödtoppig [Red-topped], Immuna, Forus and Yellow Tankard are under investigation. Line 070, a new turnip line from Immuna II, has shown promise. Crosses between turnip and swede have been effected.

Rape. Crosses have been effected in swede rape and turnip rape, using both Swedish and introduced varieties, the aims being the improvement of winter hardiness in swede rape and of yielding capacity in turnip rape.

Beetroot. With the aim of obtaining material more suitable for seed production in Sweden, beetroot has been crossed with sugar beet.

Carrot. Improvement in quality is being attempted in the crosses Amsterdam x London torg [London Market] and Amsterdam x Regulus. The new line 1021 from London torg is expected to be released in 1958.

Allium. Male-sterile onions from the USA are being employed in breeding.

Two highly uniform families of leek, from S:t Jörgen [Saint George] and Köpenhamns torg [Copenhagen Market], are being multiplied and crosses between them are being studied.

Cabbage. Amager vinter W:s/53 [Amager Winter W:s/53], which has been recognized as first class, exceeds Amager vinter W:s/47 in both yield and keeping quality and is being employed in crosses with good Danish and Netherlands strains.

Kale. With the aim of improving fodder quality this crop is being crossed with cabbage, Brussels sprouts, Savoy cabbage and broccoli, particular attention being given to crossing F_1 hybrids of fodder kale x cabbage with Savoy cabbage and with kohl rabi.

Cauliflower. Material from Frankfurter x Stor Svensk [Large Swedish] is being studied with a view to developing both larger varieties for summer and autumn use and hardy cauliflowers. Other crosses have been made in an attempt to improve the quality of Stor Svensk.

Lettuce. Line 185, selected from Cheshunt Early Giant, has been named Urania [cf. XXVII, 2362]. X-irradiated material is being studied.

Cucumber. With the aim of obtaining (1) a type combining earliness with hardiness and disease resistance, (2) a high-yielding midearly type with large fruits, also hardy and disease resistant and (3) strains suitable for cultivation at lower greenhouse temperatures, crosses have been effected among Butchers, Vestervang, Hunderup, W:s Perseus, Beste von Allen [Best of All], Sport Resisting, Clapman's Market and various central and southern European types. Tetraploids of forcing cucumbers have been obtained. An F_1 hybrid characterized by earliness, high yield and good resistance to *Cercospora melonis* has been developed. American and Netherlands varieties resistant to *Cladosporium cucumerinum* have been used in crosses with Swedish commercial varieties.

Tomato. Greenhouse and outdoor tomatoes have been crossed with *Solanum racemigerum* with a view to improving earliness and resistance to fungal diseases. Neutron and X irradiation is in progress to obtain mutants for use in breeding.

Phaseolus. Varieties differing in maturity period by one day in Skåne differed by several days in Norrland. The variety Konserva II/54 from Hinrichs jätte [Hinrich's Giant] x Konserva, which is highly resistant to diseases, and the stringless bean Särla/54, resembling Hundra för en [Hundred for One], have received the designation first class. Differences in the ability of germinating seeds to survive unfavourable weather conditions have been found to be genetically determined. Line 4445, from Stella x Bagnolet, did particularly well in the years 1954, 1956 and 1957, which were generally unfavourable for beans. Promising material developed from interspecific crosses and back crosses between *Ph. vulgaris* and *Ph. multiflorus* has proved hardy at the germination, seedling and adult-plant stages and shows high resistance to anthracnose.

Pea. Apollo II/54, a marrowfat pea with the sugar-pea type of pod, developed from Apollo x Balder, has been recognized as first class in state trials and is expected to be released in 1958. Another first-class variety, Hermes/54, is being multiplied. Sugar peas free from the tendency to mutate to tough-podded types have been produced.

Dill. In addition to Tetra W:s/55 [XXVII, 192], recognized as first class, the new variety W:s KIV has been produced. Developed from a cross between common dill and Mammuth [Mammoth], it is leafy and more compact than common dill, has larger heads and gives higher yields both under glass and in the open.

Parsley. Crosses between parsnip-rooted and curled-leaf varieties have been effected in an attempt to produce a variety combining the two characters.

2640 LUNDIN, P.
Försöksverksamheten på Bjertorp. (**Experimental work at Bjertorp**).
Weibulls Årsb. Växtföräd. Växtodling 1958 : **53** : 28–31.

At the new branch of the Weibullsholm Plant Breeding Institute, established at Bjertorp in the Vara region, Sweden, in 1956, trials of oats, barley, wheat, forage crops, oil crops, peas and beans for western Sweden are in progress.

2641 WEIBULL, G.
Weibullsholms Växtförädlingsanstalt under ett halvt sekel. (**Weibullsholm Plant Breeding Institute during half a century**).
Weibulls Årsb. Växtföräd. Växtodling 1958 : **53** : 2–14.

Breeding by selection has been carried out by the Weibulls at Weibullsholm since about 1885, but crossing as a practicable breeding method was not established until 1907–08 under Walter Weibull. The main achievements of the institute since that time are outlined.

2642 ÅKERBERG, E.
Svalöfs sorter i norrländskt jordbruk. (**Svalöf varieties in Norrland agriculture**).
Sverig. Utsädesfören. Tidskr. 1957 : **67** : 366–71.

In view of the special climatic adaptation required in crop plants grown in northern Sweden, the breeding and selection work of the local branch station of the Swedish Seed Association at Luleå, Norrland, is of great importance to the agriculture of the region. Promising new Norrland varieties mentioned are the barley J44/201, which yields 7% more than Edda, the tetraploid red clover Å066 and a new pea, L50/23, which outyields Vesta by 25%. Tetraploid turnips have also given high yields compared with diploids.

2643 BERGSTRÖM, C.
Sveriges Utsädesförenings Övre-Norrlandsfilial. (**The Upper Norrland branch of the Swedish Seed Association**).
Sverig. Utsädesfören. Tidskr. 1957 : **67** : 372–80.

The activities of the branch station at Luleå since its foundation 50 years ago are briefly surveyed. Among the recently bred crop varieties referred to are: Bottnia II timothy [XXV, 2059] and Bottnia II meadow fescue [1728]; a red fescue strain developed from material from Glommersträsk, Lapland, which is early, productive, very winter hardy and persistent; a highly uniform and productive red clover, L033, and a tetraploid red clover, L082, which overwinters better than diploid varieties; oat selections from Same and (Mesdag x Orion II) x Sirius I, which have exceeded Same in grain yield; the barley selection L44/691 from Edda I, outyielding both its parent and Vega; and the pea L50/23 from 03143 x 05323 [2642]. Breeding of potato and turnip is in progress.

2644 OLESEN, J.
57. Beretning om Planteavlsarbejdet i Landboforeningerne i Jylland. (**57th report on the crop production work of the agricultural associations in Jutland**). 1957 (1958) : Pp. 675.

This report on field experiments in Jutland, Denmark, carried out by local agricultural associations, includes the results of varietal trials of wheat, rye, barley and potato.

2645 HOLME HANSEN, H. H.
Lokale Forsøg og andre Planteavlsarbejder. (**Local trials and other crop production work**).
Planteavl. Loll.-Falster. 1957 (1958) : 15–19.

The work described includes the results of varietal and strain trials of wheat, oats, barley, lucerne, clover and sugar beet, carried out in recent years in numerous localities in Lolland and Falster, Denmark.

2646 Thøgersen, O.
Beretning om landboforeningernes virksomhed for planteavlen på Sjælland 1957. **(Report on the activities of the agricultural associations regarding crop production in Sjælland, 1957).**
København 1958 : Pp. 280.

Among the details reported here of field experiments carried out by local agricultural associations in Sjælland, Denmark, are the results of varietal trials of wheat, oats, rye, barley and potato.

2647 Koopman, C.
Plantenveredeling voor 35 jaar en nu. **(Plant breeding 35 years ago and now).**
Zaadbelangen 1958 : **12** : 4–6.

After presenting evidence of improvements in crop yields in the Netherlands due to plant breeding work over the past 35 years, the author surveys the expansion of crop-breeding establishments over the same period and reviews the prospects of further increases in yields. In discussing the production of the Netherlands Varietal List, it is suggested that greater application of practical experiences with varieties should be made in compiling it.

2648 Pruckov, F.
(Agricultural science in China).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 1 : 71–73. [Russian].

The results of breeding work at various Chinese institutes include new high-yielding wheats, resistant to *Puccinia* and lodging, rice varieties productive on irrigated land and a high quality cotton variety with an average lint length of 38–40 mm. The latter and also a wheat outyielding Pi-ma 1 by 13% were obtained by vegetative hybridization. This method was also employed to develop new forms of rice and sweet potato. The graft hybrid rice/maize has given a seed progeny with more panicles than usual and these are said to be longer and more productive than those of ordinary varieties; this form is resistant to lodging, shedding and drought. A new sweet potato, obtained by grafting a Chinese Convolvulaceous plant on to a sweet potato, has larger tubers than the rootstock variety and outyields common varieties of sweet potato.

Symposium on Integration of Agricultural Research, Education and Extension, 5th September 1957.
Madras agric. J. 1957 : **44** : 579–662.

2649 *Subramanyam, K. Opening speech. (pp. 580–87).*

A brief account of the change in techniques used in plant breeding is included, mention being made of interspecific hybridization in *Saccharum* and the use of chromosome doubling by colchicine to increase the fertility of interspecific and intergeneric hybrids. The value of plant introduction in the improvement of crop plants is also mentioned.

2650 *Ponnaiya, B. W. X. & Subramanian, A. Integration of agricultural education and research—plant breeder's view. (pp. 609–10).*

Giving the use and abuse of hybrid maize and sorghum as an example, the speaker emphasized the importance of an extension and education service to enable farmers to make the best possible use of improvements made by plant breeders.

2651 *Abdul Samad, A. Integration of research, education and extension in relation to paddy cultivation. (pp. 611–14).*

The importance of the use of well-adapted, disease-resistant varieties is emphasized, the increased production in the Tanjore delta resulting from the use of blast-resistant strains being given as an example of the value of the new varieties. Current breeding programmes in Madras are briefly mentioned.

Proceedings of the Fifth Scientific Workers' Conference held in the Agricultural College and Research Institute, Coimbatore, on 22nd August 1955 (1956) : Pp. 106.

2652 *Iyengar, N. K. & Ramachandran, K. Further studies in heterosis in perennial cotton. (pp. 12–15).*

F_1 *Gossypium hirsutum* 'Mocó' x *G. barbadense* 'Quebradinho' maintained its heterosis for yield of seed cotton and halo length in the third year of planting, after being allowed to ratoon in the previous year [cf. 123]. F_1 hybrids of *G. hirsutum* 'Caramura' x Quebradinho and Caramura x *G. barbadense* 'SIV135' showed persistence of heterosis only with respect to halo length. With a view to producing high-yielding perennial F_1 hybrids for certain areas, lines of Mocó, Quebradinho and other suitable parents are to be developed which are true breeding for disease resistance and other desirable characters.

2653 *Nayer, T. G., Sundararaj, J. S. & Seshadri, V. S. Nendran banana—its culture and taxonomical status.* (*pp. 42–43*). (Abst.)

The above variety is described as showing the characteristics of both *Musa acuminata* and *M. balbisiana*. It is therefore considered to have originated through hybridization between these two species.

2654 *Kandaswamy, M. & Sundaram, N. V. Studies on the rust resistant wheat varieties in Madras State.* (*pp. 70–74*).

Trials were carried out on varieties from Australia, Kenya and wheat-breeding centres in India. Charter proved to be resistant to stem rust and suitable for the plains. Gabo and Spica did well in the hills, the former variety being resistant to stem rust and moderately resistant to leaf rust and the latter resistant to stem, leaf and yellow rusts.

2655 *Iyengar, N. K., Santhanamswamy, V. & Rajogopalan, D. S. Notes on the performance of inter-specific hybrids involving wild species of Gossypium. II*—Hirsutum raimondii *crosses.* (*pp. 85–88*).

A colchicine-induced hexaploid of *Gossypium hirsutum* 'Cambodia-2 4463' x *G. raimondii* was back crossed twice to Madras Cambodia Uganda 1. A single BC_2 plant was line bred, selection for yield, halo length, ginning percentage and black-arm resistance being effected. F_8 progenies have been isolated which are equal to the recurrent parent in yield of seed cotton but superior to it in halo length and ginning outturn.

7th Scientific Workers' Conference, 5th September 1957.
Madras agric. J. 1957 : **44** : 663–72.

2656 *Sukanya Bai, K. M. V., Rajogopalan, K. & Abdul Samad, A. Studies on a few mutations in rice varieties induced by chemicals.* (*p. 664*). (*Abst.*).

Increased yields were given by 14 selections from GEB24 treated with acenapththene and one from Co. 13, also treated with acenaphthene. The selections from GEB24 were taller and produced more tillers and finer grains than their parent strain and some were about a week later in maturity. Four selections from ceresan-treated Co.13 have also given increased yields and are two to five days later in maturing.

2657 *Sandararaj, J. S., Padmanabhan Nambisan, K. M. & Appaiyan, M. C. Hybridisation and its scope for improvements in bananas.* (*p. 667*). (*Abst.*).

The range of female fertility and degree of compatibility shown by cultivated varieties of *Musa acuminata*, *M. banksii*, *M. balbisiana* and *M. chiliocarpa* have been investigated. Viable seeds were obtained from the following crosses: *M. acuminata* 'Poovan' ♀ x wild *M. acuminata* ♂, *M. balbisiana* 'Monthan' x *M. coccinea* and *M. balbisiana* 'Pey Kunnan', 'Venneettin Mannan', 'Thote' and 'Raja Vazhai' ♀ x wild *M. balbisiana*, *M. coccinea* and *M. chiliocarpa* ♂. No viable seed were obtained either from 'Rasthali' ♀ x wild *M. balbisiana*, *M. coccinea* and *M. chiliocarpa* ♂ or from *M. balbisiana* 'Monthan' ♀ x wild *M. balbisiana* ♂.

2658 *Neelakantan, L., Santhanam, V. & Annappan, R. S: A note on the breeding trials for the improvement of rain-fed American cotton in Madras State.* (*p. 669*). (*Abst*).

All the Cambodia selections under trial in the Periakulam district cotton breeding programme are superior in respect of lint yield and fibre length and have given promising results in spinning trials. Strain 90309 does well under both irrigated and unirrigated conditions.

2659 *Krishnaswamy, N., Raman, V. S. & Chandrasekaran, P. Some new hybrids in grain sorghums.* (*pp. 669–70*). (*Abst.*).

Use has been made of male-sterile, asynaptic lines of *S. halepense*, with $2n = 20$, in the improvement of grain sorghum, $2n = 40$, since these lines produced viable female gametes with 20 chromosomes. Perennial, tillering, drought-resistant lines have been produced in this way and some perennial, drought-resistant lines with lower HCN contents, for use either for grain or fodder, have been selected from other crosses. It is suggested that *S. halepense* strains with $2n = 40$ are autopolyploid and are closely related to the cultivated grain sorghums, difficulties encountered in crossing being due to differences in chromosome numbers and time of anthesis. Cultivated grain and fodder varieties have probably evolved from lines of *S. halepense* with $2n = 20$.

2660 **Annual report of the Central Rainlands Research Station, Sudan 1954/55.** (Mimeographed).

Sorghum. Of the introduced dwarf varieties Bonita [Pretty] x Hegari gave the most promising yields at early and late plantings; local varieties were best at normal planting dates. Strains of Wad Akr gave high yields and were suitable for mechanical harvesting. Dwarf lines resistant to mechanical and pathological lodging were isolated from local types; some of the lines appeared immune to *Sclerotium bataticola* (*Macrophomina phaseoli*). Four varieties showed some resistance to *Colletotrichum* sp. and *Ramulispora* sp. Varietal differences in susceptibility to *Atherigona* sp. were noticed. Varieties were classified according to their morphological characters.

Cotton. A satisfactory yield was obtained from BAR 7/1.2 selected for mechanical picking. Three varieties, BAR/7, BAR 7/8.2 and BAR 7/8.1, were highly resistant to *Xanthomonas malvacearum*.

Kenaf. Selections were made of unbranched strains of uniform height.

Sesame. Breeding for indehiscent capsules, and increased number of capsules is in progress. Time of flowering appeared to be controlled by a gene complex.

Sunflower. Attempts to isolate self-fertilizing types were continued.

Chloris gayana. Of the five varieties tested, the Tozi strain survived the dry season better than introduced types and appeared more adapted to alkaline soils.

Groundnut. Barberton and Kawanda B725 were found suitable for mechanical harvesting. A high-yielding strain with large seeds was isolated from Natal Common.

Soya bean. In a trial of Egyptian introductions, NA6/45 Hayseed was the most promising.

2661 **Annual report of the Central Rainland Research Station, Sudan 1955/56.** (Mimeographed).

The results are reported of tests of varieties and new selections of maize, sorghum, cotton, sesame, safflower and groundnut. Strains of the sorghum variety Feterita Abu Direira were highly resistant to *Atherigona* sp.

2662 **Annual report of the Central Rainlands Research Station, Sudan 1956/57.** (Mimeographed).

In addition to the work mentioned below, varietal trials of maize, cotton, sesame, safflower and groundnut were carried out.

Sorghum. Selection for high yield, disease resistance, absence of tillering and lodging and morphological characters which facilitate mechanical harvesting is in progress. Wad Akr selections were particularly promising.

Sesame. Crosses were made to produce a branched indehiscent type suitable for mechanized farming. Gideim and Hindi showed some tolerance of *Pseudomonas sesami*.

Sunflower. Genetical studies were continued on the self-fertilizing character in some strains of Giant Russian.

2663 Rapport du Conseil de l'Expérimentation et des Recherches Agronomiques pour 1955. (**Report of the Council for Agronomic Experimentation and Research for 1955**), Alger 1957 : Pp. 269.

In addition to the crops mentioned below, the results of varietal trials of barley, maize, potato, sugar beet, forage plants, tobacco, citrus fruits, figs, olives, dates, grapes, tomatoes, beans, peas, chickpeas and lentils are presented; the trials were carried out at various stations in Algeria.

Cereals. Information is provided on the performance of hard-wheat lines from crosses between Zénati and Bouteille [Bottle], other crosses involving Zénati x Bouteille hybrids, Palestinian hybrids and other varieties of various origin; the results are also reported of trials of several soft wheats. Some oat varieties descended from Cowra have shown promise as grain and forage crops.

Orange. A mutation of the Washington navel orange was found in Boufarik. The fruits are oblong and of small size; the navel is poorly developed.

2664 Rapport Annuel pour l'exercice 1956. (**Annual Report for the financial year 1956**).
Publ. Inst. nat. agron. Congo belge 1958 : Pp. 548.

Breeding of wheat, barley, maize, sorghum, *Eleusine*, forage grasses and legumes, potato, sweet potato, sugar cane, tea, *Capsicum*, *Piper*, *Pyrethrum*, castor oil plant, citrus fruits, peach, avocado, bean, *Vigna* and pea is reported; varietal trials of all these crops were held at various centres throughout the Belgian Congo.

Rice. In order to improve the grain quality and resistance to lodging of some Yangambi lines, these are being crossed with Rexarh* and Vary Lava. Descriptions are provided of the new lines R66, R67, R20 and R70; these are promising in respect of productivity and quality. Information is also provided on the grain quality of a series of recent hybrids and selections adapted to Yangambi conditions. Tetraploids of R66 were obtained by colchicine treatment.

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* Presumably = Rexark.

Grasses. The following chromosome counts were made: *Cenchrus ciliaris*, $2n = 34$; *Jardinea congensis*, $2n = 54$; *Setaria restoidea*, $2n = 36$; *S. trinervia*, $2n = 18$; *Brachiaria brizantha*, $2n = 18$ and $2n = 36$; and *Axonopus compressus*, $2n = 60$.

Leguminous Crops. *Desmodium triflorum*, *Centrosema pubescens*, and three varieties of *Mucuna pruriens* had chromosome numbers of $2n = 22$; *Stylosanthes gracilis* had $2n = 20$.

Cotton. At Yangambi, chromosome counts of $2n = 52$ and $2n = 104$ were made from root-tip preparations of the cross *Gossypium hirsutum* ($2n = 52$) x *G. thurberi* ($2n = 26$) after colchicine treatment. Several interspecific hybrids were also treated with colchicine at the Gandajika station. Data are provided on the principal characters of the best lines recently selected at Bambesa. Selections from the cross 2–3 Stoneville 5 x Clevewilt 22 and from Bambesa 49 have shown good resistance to wilt and C2–1368 is still immune. New crosses were made at Bambesa and at Gandajika; at the latter centre, some NC7 lines showed promise in respect of fibre length and productivity and several other new lines are of good quality. Hybrids between diploids were more resistant to *Paurocephala gossypii* than tetraploid forms. Species found tolerant or resistant to *Heterodera marioni* are listed.

Cassava. Details are provided on the characteristics of 11 élite clones and 15 clones are classified according to their yielding capacity in respect of starch. At Kibangula, the clones Amer de 6 mois [Six-monthly Bitter], S02961, S02715, S02945 and Kabumbu showed high resistance to mosaic.

Tobacco. Differences in varietal susceptibility to nematodes are noted, Pryor being the most resistant.

Coffea. At Yangambi attempts to effect self pollination in five clones of *C. robusta* failed, the pollen tubes being unable to grow through the style. Tetraploid and mixoploid seedlings of *C. robusta* were obtained by colchicine treatment and the chromosome number of *C. kawisari* was verified as $2n = 44$. *C. robusta* x *C. congensis* hybrids are undergoing study and a number of intraspecific crosses were made. Clones E29, E14, E90 and E105, all of which tend to be many-stemmed, and the single-stemmed clones L14 and L44 have proved vigorous and early. The performance of some illegitimate seedlings is described.

Cacao. From studies of self-sterile clones, it appeared that failure of pollen tubes to grow down the style is only one cause of incompatibility; if the pollen tube reaches the ovary, the nuclei of the gametes may fail to fuse or the development of the fertilized ovule may be abnormal or arrested. The results are reported of trials held in Yangambi with clones and seedlings from Forastero mother trees and from hybrids originating from Eala, Likimi and Mobwasa; the Forastero material was earlier but not so vigorous as the hybrids.

Oil palm. Investigations at Yangambi indicated that the *albescens* character is controlled by a single recessive factor; studies on the inheritance of the *virescens* character are continuing. Information is presented on the productivity of *Elaeis melanococca* x *E. guineensis* hybrids and a series of Yangambi selections. At Kiyaka attempts are being made to produce lines suited to the conditions of Kwango-Kasai; details are provided on the characteristics of selected mother trees.

Rubber. In *Hevea benthamiana* ($2n = 36$), meiosis appeared to be normal; the presence of four chromosomes with satellites associated with the nucleolus indicated a tetraploid origin for this species. Studies on *H. spruceana* are not yet completed but it appears to resemble *H. benthamiana* cytogenetically. *H. guyanensis* has $2n = 36$; the chromosomes are short and thin and four of them are satellited. Investigations of the floral biology of *H. brasiliensis* indicated that pollination is effected by insects. At Yangambi, clone M8 showed considerable resistance to brown bast and *Oidium heveae*. Information is provided on the yielding capacity and quality of the latex of a series of clones and legitimate and illegitimate seedlings.

Groundnut. Crosses were carried out involving the high-yielding varieties P43 and A23, A90, which has a high oil content, and P50, which produces large seeds.

Banana. Diploid and tetraploid forms of the cross Mayumbe x *M. acuminata* and diploids from Km5 x *M. acuminata* are undergoing study and triploid parthenocarpic forms are being sought amongst crosses between the above mentioned types. The tetraploids were particularly vigorous.

Soya bean. Comparative trials indicated that late varieties are more productive than the earlier varieties which are more sensitive to environmental conditions. Data on yield and protein content of the beans are provided for a series of early, mid and late-season varieties. Notes are provided on floral biology and methods used in emasculation.

2665 DEVRED, R. & HARDY, R.
Résultats et commentaires agronomiques d'une mission pédo-botanique au Kwango. (**Results and agronomic commentaries from a pedological and botanical mission to Kwango**).
Bull. agric. Congo belge 1957 : **48** : 1381–424.

A brief report is given of the work of the Experimental Station at Kiyaki, Belgian Congo [cf. XXIV, 2752].

2666 **Annual Report of the Department of Agriculture, Colony of Mauritius, 1955** (1957). Pp. 108.

Maize. Preliminary work on the production of maize resistant to *Puccinia polysora* was initiated by a study of material introduced from east and west Africa.

Tobacco. Hybrids between the black-shank-resistant cigar-wrapper type Rg and flue-cured Virginia varieties are highly resistant to this disease but inferior in quality to their flue-cured parents.

2667 **Report of the Minister of Agriculture for Canada for the year ended March 31, 1957.** Pp. 159.

Statistics. Tables and procedures for detecting genetic linkage by the use of the Fisher-Finney-Bailey *u* statistics have been developed.

Bacterial genetics. The possibility that mutants of pathogenic fungi and bacteria with increased virulence may be induced by fungicides, insecticides and other agricultural chemicals requires investigation. Studies have therefore been initiated with *Xanthomonas phaseoli*, to establish a suitable basis of genetical information for the exploration of this problem.

Wheat. Varieties such as Kenya Farmer and Kenya 360H are being used to breed spring wheat with greater stem-rust resistance, while Frontana and Exchange are being employed as sources of resistance to leaf rust.

The soft white spring wheat Lemhi 53 (Kenya x Lemhi^5), moderately resistant to stem rust and equal to Lemhi in quality, yield and other agronomic characters, was licensed [cf. XXIV, 2856]. The durum wheat Ramsey was also licensed [cf. XXVI, 3206].

Breeding at Ottawa has resulted in winter wheats which are resistant not only to dwarf bunt but also to common bunt and loose smut. Plans were made for the maintenance of a Canadian collection of the most useful breeding stocks in the world. Crosses were planned to create stocks not otherwise available.

Some success has been achieved in transferring a segment of an *Agropyron* chromosome carrying genes for rust resistance to a wheat chromosome. A few rust-resistant lines have been established which are highly fertile. The number of 21 pairs is stable and pairing normal.

Only a few varieties appeared to be resistant to *Helminthosporium sativum* (*Cochliobolus sativus*) when subjected to a severe laboratory test. Mutants of the pathogen were obtained by irradiation and chemical treatment. A golden-spored mutant appeared spontaneously.

Several selections from crosses between wheat and *Agropyron* were resistant to streak mosaic while others were symptomless carriers of the virus. The mite vector failed to survive or reproduce normally on most but not all of the resistant lines.

The prevalence of stem-rust race 15B in western Canada decreased markedly in 1956 while that of races 11 and 56 increased. The decline in the occurrence of 15B was accompanied by changes in the abundance of its constituent biotypes, a decrease being detected in the originally common type and an increase in the type virulent to Golden Ball and certain other durum varieties.

An expansion test developed in the Cereal Crops Division is being used for the evaluation of baking strength in hybrid lines during the early stage of selection. A single test requires 5 g. of flour.

Oats. Fundy [cf. XXVII, 1657] and Shield [cf. XXVIII, 351] were released.

From the cross CD3820 (2*n Avena strigosa*) x CD4549 (4*n A. abyssinica*), fully fertile tetraploids have been selected which possess the crown and stem-rust resistance of the former parent. The tetraploids are now being used in crosses in an attempt to introduce their disease resistance to cultivated oats.

Progress was made in devising techniques for classifying varieties for reaction to *Leptosphaeria avenaria* in the field and at the seedling stage in the greenhouse.

High-yielding varieties resistant to rust and smut have been developed from (Santa Fe x RL1942) x Garry for use if the resistance of Garry and Rodney breaks down. The new varieties are resistant to all races of stem rust and to 86 of the 88 races of crown rust which have been identified in North America.

Maize. The inbred CH9 transmitted at least part of its resistance to root and stalk rot in single crosses with susceptible inbreds.

Barley. The malting barley Parkland was introduced [cf. XXVI, 2326].

A collection of about 1000 of the best genetic stocks has been assembled by the Cereal Crops Division, Ottawa.

Two-rowed barleys, chiefly varieties recently released in Europe, are being tested for their suitability for certain regions.

Over 75 crosses have been made between wild species of *Hordeum* and cultivated barleys. Material from (*H. leporinum* x *H. vulgare*) x *H. vulgare* is at the most advanced stage. Selections from this cross have produced lines with characters of *H. vulgare* but better disease resistance, greater lodging resistance and a more vigorous growth type than are normally found in barley.

Techniques have been developed to measure resistance to leaf blotch (*Septoria passerinii*) and net blotch [*Helminthosporium* (*Pyrenophora*) *teres*] in greenhouses and growth cabinets. Varieties with resistance to several cultures of the former pathogen were crossed with commercial barleys and the resulting progenies screened for resistance. A search for sources of resistance to net blotch was initiated.

Lucerne. Selection and intercrossing at Ste. Anne de la Pocatière, Que., have resulted in the development of plants in which yield reduction due to manganese toxicity was only about one seventh of that in the most tolerant parental material at similar levels of toxicity.

A strain of *Medicago falcata* developed at Ottawa from seed of wild material of Russian origin has proved superior to all other species and varieties of cultivated legumes in winter hardiness at the Pine Creek Station, YT.

The fungus responsible for winter crown rot produces hydrogen cyanide. Differences in pathogenicity between strains were directly related to disparities in ability to produce this gas. Resistance to damage due to the gas was related to the acidity of the tissues.

Red clover. The Plant Pathology Laboratory at Edmonton is cooperating with the Lacombe Experimental Farm in testing varieties and strains from northern Europe, Alaska and the USA, together with standard Canadian varieties, for resistance to northern anthracnose (*Kabatiella caulivora*). Wisconsin Polycross was highly resistant and also free from powdery mildew, while Ultuna Tetraploid exhibited a high degree of resistance to northern anthracnose but susceptibility to powdery mildew.

Swede. Varieties developed at the Nappan Experimental Farm, NS, have shown greater resistance to club root in preliminary tests than any varieties previously available.

Potato. The scab-resistant variety Huron has been developed [cf. XX, 1297]. Work has been initiated on the transference of the insect and disease resistance of certain wild species to commercial breeding stocks.

Several varieties tested at Fredericton, NB, showed resistance to the widely-occurring virus S, Saco being particularly resistant. A virus designated M was isolated from Irish Cobbler; Saco is susceptible to this virus, which bears a slight serological relationship to S. Neither S nor M is confined in its natural occurrence to King Edward, as was previously believed to be the case. Kennebec has exhibited considerable resistance to virus Y under field conditions. Seedlings from a selfed variety have been selected for field testing since they proved to be hypersensitive to some common strains of Y.

Fourteen races have been identified among isolates of *Phytophthora infestans* collected throughout Canada. All these races occurred in eastern Canada, only three being found in the Prairie Provinces. Race 4 was the most common; race 1,4 was also prevalent. Blight-immune, fertile diploids of *Solanum bulbocastanum* have been found among collections made in Mexico and Guatemala.

Tobacco. Four strains of cigar tobacco, 20–25% lower in nicotine and total alkaloids than commercial varieties, have been developed at Ottawa. They compare favourably with the latter in yield and crop returns. In preliminary smoking tests, cigars made from the new strains were preferred to those manufactured from commercial cigar-filler varieties.

Strains of cigarette Burley maturing about one week before the standard varieties have resulted from breeding at Harrow, Ont. This earlier maturity is an advantage in the production of high-quality grades. Most of the strains are highly resistant to black and brown root rots.

Oil crops. The wide range of values obtained for oleic and linolenic acids in an analysis of foreign varieties of linseed indicated that it may be possible to change the fatty acid composition of the oil through selection.

Lipid synthesis in linseed and safflower is being investigated in order to facilitate selection.

Although the progeny of some new crosses and strains of sunflower under test at Ste. Anne de la Pocatière for resistance to downy mildew exhibited no external symptoms of the disease and had been considered immune, root examination revealed infection.

Apple. Scab-immune seedlings from 14 crosses tested at Kentville, NS, comprised 0 to 24% of the population, with an average of 6%.

Apricot. Polyploids have been obtained at Summerland, BC, by treating the growing tips of three varieties with 0·75–1·25% colchicine. This treatment also resulted in seedlings with growth characteristics other than those usually associated with polyploidy; it is considered that the changes represent variations which may be transmitted to the sexual progeny.

Strawberry. The new variety Agassiz has been introduced in British Columbia on account of its superiority in fruit size, uniformity, colour and freezing quality to British Sovereign.

Cranberry. A selection made at Kentville, NS, has been named Beaver. It ripens a week earlier than Early Black and has rounder fruits with an attractive bright red colour.

Tomato. Work on the incorporation of resistance to *Verticillium* wilt into commercial varieties is in progress. In the back crosses a 1 : 1 ratio between resistant and susceptible plants has been obtained.

Scotia and Ken have been introduced by the Kentville Experimental Farm. The former variety shows promise for cool, relatively short-season areas on account of its very early ripening. Especially suitable for the domestic garden, Ken is an early tomato with dwarf habit and uniformity in ripening. Another new variety, developed at Morden, has been named Manitoba. With high quality and resistance to stem-end cracking, it shows promise for canning in south-central Manitoba.

Soya bean. The new variety Crest was released.

2668 **The National Research Council Review, Ottawa 1957** : Pp. 289.

Associate Committee on Plant Breeding (*pp*. 220–26).

The following projects were under way during 1956:—

University of Manitoba.

Work has continued on the substitution of rye chromosomes in winter wheat and the development of ring formation in barley and studies of the B genome in wheat have been initiated.

University of Saskatchewan

Further work has been carried out on the inheritance of reaction to stem rust race 15B in diallel crosses of four durum varieties and on radiation-induced mutations in plants. New projects include a study of the linkage relationship of the factor or factors governing resistance to Titan-attacking races of loose smut in barley, chromosome substitution in *Triticum* species, the development of special methods of hybridization in the cereals and cytogenetic studies of Saskatchewan legumes, especially *Astragalus* and *Oxytropis*.

2669 **Progress Report of the Experimental Farm, Kentville, Nova Scotia, 1952–1956** (1957) : Pp. 42.

Sweet pepper. Selections from crosses of Vinedale, Earliest Red Sweet, Pacemaker, Merrimack Wonder and Pennwonder are being compared with the parental varieties as producers of early red peppers.

Apple. Progress has been made in breeding a late, high-quality, red apple.

Many hybrids with *Malus* spp. which carry factors for resistance to scab are under investigation. About 10–15% of the seedlings from crosses having Geneva Crab as a parent are resistant and about 5% immune. Higher proportions of immune seedlings have been secured from back crosses of hybrids involving such species as *M. floribunda* and *M. prunifolia* but the fruits are smaller and poorer in quality. Recent crosses included $4n$ x $2n$ combinations. Sectorial and complete colour sports have been induced in Cortland by treatment with X rays and thermal neutrons [cf. XXVII, 3385 and 4310].

Rubus. Raspberry seedlings have been produced from varietal and interspecific crosses of parents having factors for hardiness. The chief species being used in *Rubus* breeding are *R. acaulis*, *R. arcticus*, *R. chamaemorus*, *R. canadensis* and *R. alleghensis*.

Blueberry. The development of a variety with a low, wide bush but easier to prune, more productive and better in fruit characters than Kengrape is being attempted. Some seedlings showing promise, except with respect to scar, are to be further studied.

A search has been made for highbush blueberries which sucker below ground. This type has not been found in highbush seedling populations. The F_2 of highbush x lowbush crosses contained a few plants with the desired habit but these were inferior to the highbush parents in other characters.

***Sambucus*.** Two varieties of *S. canadensis*, Victoria and Kent, are being introduced. Open-pollinated seedlings of Adams [XXVI, 3757], they are equal to their parent in berry size but earlier. No viable seed has been obtained from hybrids of *S. canadensis* x *S. pubens*. The possibility of inducing fertility as the result of chromosome doubling through colchicine treatment is being explored.

Strawberry. A late-fruiting variety with bright appearance and very firm flesh is desired; three selections from Catskill x Temple have reached the stage of being placed in a variety test plot.

Cranberry. The early-ripening variety Beaver was introduced in 1955 [2667]. Reciprocal crosses have been made between Beaver and Early Black in the hope of combining the false-blossom resistance of the latter variety with the good fruit qualities of the former.

Grape. An earlier-maturing blue grape is required. Commercially acceptable varieties maturing in other areas of Canada fail to ripen in Nova Scotia. Although poor in yield and quality, a number of varieties, however, mature their fruit each year. Seedlings from crosses between such varieties are expected to fruit in 1957.

Onion. Kenearly, an early flat type, has been selected with the aim of producing an earlier-maturing strain which will be more nearly globe-shaped. It is also hoped that an early-maturing globe-shaped variety will be obtained from Kenearly x Sweet Spanish. Male-sterile lines from the US Department of Agriculture have been crossed with Kenearly for the production of F_1 hybrids.

Tomato. Scotia and Ken are being distributed [2667]. Progress has been made in breeding for resistance to *Phytophthora infestans.*

2670 **Director's Annual Report of the Mexican Agricultural Program September 1, 1955–August 31, 1956** : Rockefeller Found., NY : Pp. 285. (Mimeographed).

Varietal trials of turnip, kohl rabi, sweet potato, radish, onion, cabbage, cauliflower, sprouts, spinach, chard, lettuce, water melon, egg plant, okra, snap bean, cowpea and pea are mentioned.

Wheat. Yaqui 54 has proved more resistant to lodging and race 15B of stem rust and given higher yields than Yaqui 50. Lerma Rojo [Red Lerma], a new variety resistant to stem rust, gave high yields in several localities. Kentana 54 is recommended for high regions on account of its resistance to frost. A new variety Gabo 55 [Gabo x (Timstein x Kenya)] is to be distributed; it has the Gabo and Kenya types of resistance to leaf rust. The Japanese dwarf Norin 10 factor is being incorporated into Mexican varieties to produce short-strawed types resistant to lodging. Selections with promising agronomic characters and resistance to stem and stripe rusts were obtained from the Colombian crosses P4160 and P4161; their pedigree is [Supremo 211 - Mentana x Gabo] x [(Thatcher-Querétaro x Kentana) x Gabo]. The results of varietal trials held in three districts are reported; varieties are recommended for four regions and for different industrial uses.

Maize. The results are given of trials of varieties and hybrids at different altitudes and under various climatic conditions. At high altitudes H–5 was superior to H–1 [cf. XXVII, 280] in yield and resistance to lodging and *Tetranychus* spp. From other studies it was concluded that methods of predicting double-cross yields from advanced lines are also useful for S_1 lines. The value of visual selection for combining ability with reference to yield did not seem to be solely dependent upon adaptation. Selection for resistance to *Fusarium moniliforme* (*Gibberella fujikuroi*), *Diplodia zeae, Physoderma zeae, Helminthosporium turcicum, H. zeae* and corn stunt virus is in progress.

Sorghum Varieties are recommended for different altitudes in several regions of Mexico. The effect of X-ray and thermal-neutron treatment on seed of several varieties is being studied. Selection for increased vitamin A content of grain and for grass types of grain sorghum is in progress.

Rice. United States commercial varieties were compared with local varieties in yield trials; the former were more resistant to lodging.

Lucerne. Brief descriptions are given of some of the local and imported varieties tested at Chapingo. The results of trials in other localities are reported.

Sweet potato. The Californian line L-51 gave good yields of high quality tubers; the flesh is deep orange and has a low fibre content.

Potato. Amongst lines which showed resistance to *Phytophthora infestans*, some from Germany and Holland also had good commercial characteristics.

Squash. Systematic and quality studies on a large collection of Mexican varieties are in progress at La Cal Grande. Early lines with good yielding capacity and high quality fruit were selected from native varieties.

Pepper. Grafting experiments continued with a view to establishing a suitable medium for interspecific and wide varietal crosses.

Tomato. Urbana appeared well adapted to tropical conditions; it does not suffer from sun scald and produces high-quality fruit. Cotaxtla 1 showed some resistance to *Cladosporium fulvum* and is recommended for the tropical Gulf Coast region. Of all the lines tested S–6 was most resistant to *Phytophthora infestans.*

Bean. Some new Canario-type lines gave higher yields than the standard variety Canario 101 [Canary 101] and required a shorter cooking time. Lines which combine the desirable

Canario characters with the black seed colour of native varieties have been produced; some of these are highly resistant to *Uromyces phaseoli* var. *typica* and are resistant to several races of *Colletotrichum lindemuthianum.* Six Bayo [Brown] hybrids proved superior in yield to commercial Bayo varieties; they are bush types and escape most diseases which attack long-vined varieties. Some black-seeded hybrids of bush type were crossed with yellow-seeded Dutch varieties. Attempts are being made to produce mutants resistant to *C. lindemuthianum* by means of X-ray and thermal-neutron treatments. Ten new races of *C. lindemuthianum* were identified in Mexico; the reactions of the differential varieties are given. Lines resistant to *Isariopsis griseola* and yellow bean mosaic were found. *Phaseolus vulgaris* x *Ph. coccineus* hybrids appeared highly resistant to *Thielaviopsis basicola.*

2671 **Director's Annual Report of the Mexican Agricultural Program, September 1, 1956-August 31, 1957:** Rockefeller Found., NY : Pp. 363.

In addition to the work reported below, varietal trials of forage grasses and legumes, sweet potato, cassava, sesame, pineapple, tomato, soya bean and vegetables [cf. 280] were carried out.

Wheat. Several lines from the hybrid P-4160 gave higher yields than all the Mexican commercial varieties. Lerma Rojo [Red Lerma] has proved adaptable to a wide range of conditions and is resistant to shattering. Selections from the cross Yaktana (P–14) x Japanese dwarf were promising in respect of short straw length, rust resistance and other agronomic characters. Variety trials were held in several localities; the principal characters of recommended varieties are listed.

Maize. Some three-way crosses involving S_1 lines of Marceño were promising; H–126 is recommended in place of Marceño for El Mexe. At high altitudes with irrigation the late hybrids H–125A and H–125 proved superior to the recommended variety H–1. High-yielding synthetic varieties adapted to natural rainfall conditions are being developed. For intermediate altitudes with irrigation H–352 and H–353 are recommended. New hybrids are ready to replace H–501 and H–503 in the hot region of northern Mexico. Selection for resistance to corn stunt virus continued.

Sorghum. In the variety trials, the taller Shallu and Hegari types suffered less bird damage than the Redbine types; Honey gave the highest yield of forage. Kafir 1 was promising as a dual-purpose sorghum. Some dwarf and tall varieties are recommended for their brush quality. Crosses were made to develop new male-sterile hybrids, and to incorporate yellow endosperm and earliness in other varieties.

Rice. The agronomic characters of 83 varieties tested in Veracruz are tabulated. Varieties which matured within 130 days gave the best yields. Century Patna 231, Bluebonnet and Century 52 were most satisfactory.

Lucerne. Selection is in progress for resistance to *Fusarium* spp., *Rhizoctonia* (*Pellicularia*) spp. and other fungi causing foot rots. Varieties are recommended for different parts of Mexico; some of these varieties are suitable for winter cultivation.

Potato. Breeding for clones which combine good commercial characters with resistance to *Phytophthora infestans* was continued. In the valleys of Toluco and Mexico, 14 races of *Ph. infestans* were identified; only complex races were found on *Solanum demissum* clones and F_1 hybrids between *S. demissum* and *S. tuberosum.* Many wild species were studied for blight resistance and chromosome counts were made. The results are reported of varietal trials held in five localities.

Squash. Lines were selected which produce seeds without a hard coat; these lines are adapted to the Chapingo region.

Bean. Three new Canario [Canary] hybrids were released as the varieties Canocel, Bayomex and Negro Mescentral [Mescentral Black]; they have yellow, tan and black seeds respectively. They are high-yielding bush types resistant to *Xanthomonas phaseoli, Uromyces phaseoli* var. *typica* and *Colletotrichum lindemuthianum.* Canario 101 [Canary 101] seed was subjected to high energy ionizing radiations; some R–2 individuals gave exceptionally high yields producing twice the number of pods normally found on Canario 101. Cooking times of 43 varieties are given; some new lines are superior in this respect to older varieties. New strains of common mosaic and yellow mosaic viruses were found in Mexico; some Mexican bean types did not transmit common mosaic through the seeds. Crosses between common and kidney beans were tested for resistance to *Fusarium* spp., *Rhizoctonia solani* (*Pellicularia filamentosa*) and *Sclerotium* (*Pellicularia*) *rolfsii.* Three alleles, referred to as *Fm, Fr,* and *f* and dominant in this order, were found responsible for purple, rose and white flower colours respectively. The climbing habit was dominant to the bush habit and rust resistance appeared dominant to susceptibility. The results of varietal trials held in Veracruz are reported.

Pea. Results of varietal trials held in several localities are given. Lines were selected for resistance to seed and root rots caused by *Fusarium* spp. and *Pythium* spp.; at least four genes seem to control resistance.

2672 Servicio Cooperativo Interamericano de Agricultura. Informe anual - 1956. (**International Cooperation Administration of the Institute of Inter-american Affairs. Annual report, 1956**). Pp. 144. (Mimeographed).

The report includes the following items concerned with plant breeding in Guatemala.

Wheat. In tests of 23 varieties, 14 of them exceeded the standard, Supremo 211, in grain yields. The first generation of the cross (Supremo x Kenya) x [(Perú x Supremo) x Perú] II 2809, received from Mexico, proved highly resistant to *Puccinia graminis* and some of the lines selected from it have also exceeded Supremo 211 in yield.

Observations are in progress on a number of intervarietal crosses in various generations from F_1 to F_4.

Maize. Two varieties which excel all others in yield have been selected, Tiquisate Amarillo Oro [Golden Yellow Tiquisate] and 142–48. They have also proved superior to maize varieties introduced from other parts of Central America and from Cuba.

Lines selected from maize growing in the coastal plains of Guatemala when crossed with the local standard have given 15–25% yield increases and are being used for making hybrids and synthetics.

In the zones between 3000 and 5500 ft., one triple hybrid from selections of local material has yielded 64–77 bushels of grain per acre. Other hybrids are better in quality though not so high in yield.

Material collected in areas above 5000 ft. has produced some 70 lines that are superior to the existing strains when tested above 5500 ft. and these are being crossed with the local maize of Quezaltenango, which is also being subjected to selection.

Forage plants. An early-maturing vigorous strain has been selected in *Vicia villosa* and selection has been carried out with *Phaseolus vulgaris*.

Coffee. A number of selections and crosses are under observation, one of the most promising being a hybrid of Maragogipe x San Ramón, which has short internodes and yields well.

Two selections each of *Coffea arabica* var. *bourbon* and var. *typica* have been treated with X rays and neutrons for the production of mutations.

Cacao. Descriptions are given of some superior trees selected from local plantations; they belong respectively to the types Criollo, Forastero subtype *amelonado* and Forastero subtype *angoleta*.

Hevea. A number of selections are under observation and some hybrids are displaying resistance to South-American leaf disease. They have been crossed with the most promising clones from the East and from Brazil.

2673 Jensen, N. F.
Marking plants with spray paints.
Agron. J. 1958 : **50** : p. 112.

Pressure cans of inexpensive, quick-drying paint or spray enamel have been found useful at the Department of Plant Breeding, Cornell University, for marking plots and plants in the field; their use may in certain cases eliminate the need for tags and stakes. So far the technique has been applied only to small-grain crops. Examples of ways in which the method has proved useful include marking (1) F_2 and other early-generation selections and (2) plants at separate times with different colours for different characteristics.

2674 **Annual Report.**
Bull. Mass. agric. Exp. Sta. 1955–1956 : No. 494 : Pp. 71.

Maize. The experimental hybrid (Pa11 x Pa54) x (Q83wt x NY3) has given an outstandingly good performance.

Forage grasses. Breeding has been initiated to produce strains of *Bromus arvensis* with rapid, early spring growth and resistance to disease and lodging. A leafy, late-maturing cocksfoot has been developed which gives good results when sown with lucerne for hay.

Cranberry. Selections from crosses are under observation.

Asparagus. The new high-yielding variety Waltham Washington was released.

Cabbage. Development of a second-early type with a small head, upright habit, dark green colour and freedom from splitting is almost complete; the seed-producing capacity of the strain now requires improvement.

Lettuce. Further progress was made in breeding a strain of the Iceberg type improved in adaptability.

Tomato. *Cladosporium* leaf mould is now a minor disease as the result of the substitution of susceptible varieties by resistant and immune varieties and F_1 hybrids. Resistance and immunity to the different strains of the pathogen have been obtained from *Lycopersicon pimpinellifolium, L. peruvianum, L. hirsutum* and other sources.

Harrow has shown good combining ability in F_1 hybrids.

Sweet corn. The inbred NJ143y–830–2 restored fertility completely to line C13 carrying the Texas type of cytoplasmic sterility. The resulting hybrid was early and productive, maturing in the same season as Marcross.

2675 **1956 Annual Report, School of Agriculture, North Carolina State College**: Pp. 33.

Cotton. Strains have been developed with sufficient resistance to boll weevil to reduce the usual amount of damage by 10–30%. Incorporation of satisfactory yielding capacity and fibre properties in this type is necessary.

Tobacco. The *Nicotiana* collection now assembled is considered to be the most complete in the tobacco-growing area of the USA. The potential value of wild species as sources of resistance to black shank, mosaic, wild fire and other diseases is stressed.

Cucurbits. The cucumber Smoothie was released [cf. XXVI, 3847].

A water-melon line from Africa showed resistance to a new race of anthracnose causing serious damage on hitherto-resistant varieties.

2676 **Results of research in 1956 by the Agricultural Experiment Station of the University of Kentucky. 68th Annual Report of the Director** : Pp. 149.

Maize. The new yellow hybrids Ky105 [(T8 x CI21E) x (38–11 x Oh7B)], Ky106 [(WF9 x 38–11) x CI21E x L317)] and Ky106A [(WF9 x 38–11) x CI21E x Oh41)] were released. Both Ky105 and Ky106A are superior to older hybrids in yield and resistance to stalk breakage. Ky106 is similar to US13 in resistance to stalk breakage and root lodging, ear position and time of maturity but is higher in yield and somewhat more resistant to southern corn leaf blight.

Forage grasses. Selections of tall fescue (*Festuca arundinacea*) for palatability have been made on the basis of grazing tests. Selections most closely grazed were in general lower in fibre and higher in protein than varieties and strains less well grazed. A highly significant correlation coefficient of + 0·81 was obtained between degree of grazing and fibre percentage. One plant in each of 44 best grazed S_3 lines derived from 8 families was subjected to fibre analysis. Fibre percentage ranged from 15·55 to 18·36 for families and from 14·93 to 19·38 within families. Although most back-cross lines from ryegrass x tall fescue were poorly grazed, some plants within lines were well grazed. Since F_1 ryegrass x tall fescue is male sterile, this combination has been treated with colchicine.

The differences observed between lines of Kentucky bluegrass (*Poa pratensis*) in competition with crabgrass (*Digitaria*) are regarded as indicative of inherent disparities in aggressiveness and as suggesting that varieties may be developed with the capacity to prevent invasion by this weed.

Forage legumes. Polycross testing was initiated to isolate clones of red clover superior in mildew, virus and rust resistance and in agronomic quality. All the interspecific hybridizations attempted in *Trifolium* failed, with the exception of *T. pratense* x *Trifolium* 'PI204517.' The hybrids were ♀ and ♂ sterile and have been treated with colchicine.

Lucerne plants from seed from Canada were screened for creeping roots; those showing the highest degree of root proliferation were selected for crossing with varieties adapted to Kentucky.

Tobacco. Homozygous lines containing 0·1–0·2% total alkaloid and similar in yield and plant type to standard varieties have been obtained.

Plant-to-plant variation in alkaloid content according to stage of growth is marked, the necessity of considering stage of growth in genetical analysis thus being emphasized. Genes found to be involved in alkaloid synthesis included a dominant one for high content, its action being detectable in the early stages of growth. Genetical investigation of nicotine conversion to nornicotine during air-curing continued.

Study of single-plant progenies of Ky16 suggested that it would not be possible to secure low-nicotine selections from such a line by choosing single plants in a large population.

F_3 lines of Burley resistant to black root rot, mosaic, *Fusarium* wilt and wild fire and considerably lower in nicotine content than standard varieties have been obtained from appropriate crosses.

One Burley line homozygous for resistance to black-shank resistance derived from *Nicotiana longiflora* has been developed. It is affected by a severe physiological leaf spot which destroys the leaf but F_1 plants from reciprocal crosses with susceptible Burley produced a satisfactory leaf.

N. longiflora and *N. plumbaginifolia* are genetically similar with respect to resistance to black shank. Since their hybrids were fully fertile, the two species are probably only variants of a single species.

Lines of dark tobacco carrying the factor of *N. debneyi* for immunity from black root rot have been developed. Resistance to mosaic, wild fire and *Fusarium* wilt is being combined with root-rot immunity.

Burley 21 and seven breeding lines of Burley showed some resistance to brown root rot caused by root-lesion nematodes and may be useful in breeding.

N. repanda proved to be highly resistant to *Myzus persicae* while *N. gossei*, *N. megalosiphon*, *N. otophora*, *N. tomentosa* and *N. tomentosiformis* were, in descending order, resistant.

The dependence of the character of one sucker in Burley upon two recessive pairs of genes was confirmed. This character and leaf width are probably controlled by the same genes.

A single recessive gene controls virescence in Burley and dark tobacco.

Pollen stored in paper containers over calcium chloride at 38° F. has been used successfully after one year.

2677 **Your division of agriculture reports . . . Report of the Division of Agriculture of the Iowa State College, Ames, Iowa, July 1956 through June 1957.** Pp. 74.

Trials with varieties of maize, grain sorghum, sweet potato, apple, apricot, plum, peach, raspberry, musk melon and sweet corn are briefly noted.

Wheat. Sources of leaf rust resistance for winter wheat have been found in introductions from England, Russia, Spain, Portugal and India.

Lucerne. The inheritance of growth habit, stem coarseness, leaf size and shape, pod shape, crown type and flower colour is under investigation. Exchange of breeding material, evaluation of selections for disease resistance and the development of synthetics are carried out in cooperation with experiment stations in neighbouring states. Vernal has continued to give outstanding results in varietal trials.

Potato. Seedlings from crosses made in 1953 have been screened for reaction to late blight and virus X and about 16,000 selections found resistant to both pathogens. Other selections are resistant to late blight, leaf roll, virus X, scab and virus Y and some advanced selections have reached the field trial stage.

Tobacco. Progeny from a number of interspecific crosses (unspecified) and X-irradiated lines and back crosses are under observation to investigate the nature of genetic tumours and the possibility of inducing mutations affecting tumour production.

Onion. Hybrid lines gave from 2% to 27% higher yields than the best open-pollinated lines and almost 100% of the onions produced were marketable, while those from the open-pollinated lines were of varying quality. The storage quality of the hybrid lines was generally superior also. Particular promise has been shown by hybrids between hard and grano lines, especially B2149 x Texas Grano 951.

Soya bean. Some strains under observation show high tolerance of 2,4-D and if this reaction is maintained it is hoped that they can be used to incorporate 2,4-D tolerance into commercial varieties. The release of Chippewa [XXV, 2512] and of the vegetable varieties Kim and Kanrich [XXVI, 3929] is noted.

Sweet corn. Some segregating inbred lines show considerable resistance to corn borer attack but no immune lines have been found. Two-eared hybrids are being developed.

2678 **A fortune to share in research.** Bull. Mo. agric. Exp. Sta. 1955 : No. 664: Pp. 108.

Trials with oats, rice, maize hybrids, forage grasses, lucerne, onion, water melon and soya bean are reported.

Cytology. It has been shown that although the relative frequencies of the various kinds of chromosomal aberrations caused by X and ultraviolet rays may differ the same types of aberration occur. This suggests that there is no qualitative difference between the effect of the two types of radiation with regard to the nature of lability of the ends of broken chromosomes and their capacity to reattach in different ways, in spite of the qualitative difference in the nature of the two kinds of radiation involved.

Wheat. Testing for resistance to *Puccinia rubigo-vera* var. *tritici* has continued and the resistance of about 6300 lines has been determined. Breeding of soft winter wheats resistant to pests and diseases has continued.

Oats. Testing for resistance to *Puccinia graminis* var. *avenae* and *P. coronata* var. *avenae* has been carried out. In order to improve the lodging resistance of O–205, crosses were made between this variety and Craigs Afterlea and early stiff-strawed strains from this cross have been selected for further evaluation. The Canadian type of resistance to all races of stem rust is being added to O–205 by back crossing.

Maize. Breeding for resistance to *Heliothis armigera* continues. Some evidence has been found that the silks of some varieties contain substances toxic to the larvae since considerable variation occurs in the mortality rate of larvae fed on different silks. Work has continued on the development of superior hybrids and in testing for disease and insect resistance.

Barley. Breeding of covered-smut resistant and other winter varieties has continued and the use of Mo B–400 [XXIII, 1184] has increased.

Lespedeza. Under certain conditions it has been found possible to separate some varieties by their susceptibility to bacterial wilt, caused by *Xanthomonas lespedezae.*

Cotton. Selection of F_3 progeny from crosses between Deltapine 15 ♂ and Tenn. 12, Tenn. 241, Tenn. 818, Empire, Plains or Wilds ♀ has been made on the basis of earliness, lint percentage and fibre length and also in 25 F_5 lines on the basis of fibre quality.

Water melon. Progeny from crosses between Missouri Queen and Black Diamond, now in the F_6, show promise in a programme for the development of a variety with the appearance and commercial qualities of Black Diamond but with additional disease resistance and improved eating quality.

Tomato. Progress has been made in the development of lines possessing wilt resistance derived from *Lycopersicon pimpinellifolium.*

2679 Memoria año 1954. **(Report, year 1954).**
Bol. Prod. Fom. agríc. B. Aires 1955 : **7** : No. 61–66 : Pp. 211.

Besides the information summarized below, results of varietal trials of potato, sugar cane, *Capsicum*, cowpea and soya bean in Argentina are reported. Trials of other crops are also in progress.

Groundnut. In trials carried out over a period of seven years in Salta, the selection 947–DCE–Mn–Tn–05 has proved best, outyielding the standard, Blanco de Santa Fe [Santa Fe White], by 54·3%. At Manfredi, the line Tn–011 surpassed Blanco de Santa Fe by 100·6% in yield of fruit and 324·9% in yield of forage. Some superior lines have been selected from Blanco de Santa Fe.

Sesame. Selection for resistance to *Fusarium sesami, Cercospora sesami, Alternaria* sp. and *Myzus persicae* is in progress. Selection in the variety Venezuela 51 has led to the production of little-branched lines or lines with single stems, with 2–3 capsules per axil, characters associated with uniform maturation. Venezuela 51 is also being crossed with Indehiscente 43–1139 to improve shattering resistance. Variation in carpel number per capsule has been observed and appears to be genetically transmitted.

2680 **Director's Annual Report of the Chilean Agricultural Program, September 1, 1956-August 31, 1957** :
Rockefeller Found., NY : Pp. 19. (Mimeographed).

A report is given of the activities of the Office of Special Studies, cooperatively established by the Rockefeller Foundation and the Chilean Ministry of Agriculture.

Wheat. Preliminary yield trials of spring wheat indicated that stem-rust resistant lines of good agronomic type from several Mexican and Colombian crosses tend to outyield the popular, high-yielding but susceptible local variety Menflo. Because of its early maturity, this variety was affected only slightly by stem rust; its yield potential therefore underwent little, if any, reduction. Advanced yield trials are now under way to decide which lines should be increased for release to commercial seed producers in 1958.

Work on the development of four stem-rust resistant composite varieties of spring wheat for the central region continued. Lines from the second and third back crosses are undergoing tests for resistance and agronomic type. The recurrent varieties used are Menflo, Florence-Aurore, Quaderna and Capelli.*

The main objective of breeding winter wheat for southern Chile is the transference of yellow-rust resistance from spring wheats to the leading varieties, almost all of which are of French origin. Promising winter wheats in collections obtained from the US Department of Agriculture are also being used in crosses.

Forage crops. A programme of introduction, selection and breeding was initiated at several centres in 1957.

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* ? = the Italian variety Cappelli.

2681 LLANO GÓMEZ, E.
Estación Agrícola Experimental de Palmira. (**The Palmira Agricultural Experimental Station**).
Agricultura trop. 1957 : **13** : 668–75.

The founding of the above station in 1928 is described and its work outlined. The latter includes the study and production of varieties of forage crops, maize, sugar cane, oil crops, fruit and beans.

2682 **Annual Report of the Department of Agriculture and Stock, Queensland, for the year 1956–57** (1957) : Pp. 123.

In addition to the work reported below mention is briefly made of varietal trials carried out with wheat, oats, maize, sorghum, cotton, safflower, mandarin, strawberry, tomato, cabbage and cowpea.

Wheat. Selections from Lawrence x Gabo have given promising performances at several centres, showing good agronomic characters, high yields and frost resistance. A strain of Puora into which resistance to stem rust has been incorporated was found to be in no way inferior to Puora but conditions in the 1956–7 season did not allow of its rust resistance being put to the test.

Oats. Bovah has generally given excellent performances but on the Atherton Tableland was heavily rusted, indicating the probable occurrence of a new strain of crown rust.

Maize. An unexpected advantage of the use of hybrids has been the considerable degree of drought tolerance which they have shown during the 1956–7 season.

Passion fruit. It has now been established that *Passiflora flavicarpa* has considerable resistance to *Fusarium* spp. and selection within this species, together with hybridization with *P. edulis*, is under way.

Tomato. A preliminary assessment of the leaf-shrivel reactions of 166 varieties and breeding lines was carried out in the greenhouse and about 20 selections were retained for future work. Progeny from *Lycopersicon esculentum* x *L. peruvianum* have also been tested and it is hoped to transfer the tolerance of the wild species to cultivated tomatoes. Testing for resistance to *Fusarium oxysporum* f. *lycopersici* has been carried out in the greenhouse and in the field with a view to establishing a stock of resistant material. An F_1 hybrid, Burwood Prize x Manalucie, has performed well in North Queensland and has also shown resistance to *Cladosporium fulvum*.

Bean. The best selections from Florida Belle x Langshaw Beauty give higher yields than Brown Beauty, are resistant to rust and are comparable with Brown Beauty in respect of quality. Trials are in progress to determine the effect of climatic selection on strain survival in Brown Beauty, which is a mixture of pure lines. Rust-resistant lines from Brown Beauty x California Small White, back crossed up to five times to Brown Beauty, have been made available for field trials. Some of these lines also possess resistance to mosaic, anthracnose, angular leaf spot, halo blight and common bacterial blight.

Cowpea. The resistance of CPI12153, Blackeye 5, Malabar and CPI12148 to stem rot, caused by *Phytophthora* sp., was confirmed at Kumbia. Progress has been made in incorporating resistance into Poona.

2683 HICKS, F. W.
Annual Report of the Department of Agriculture, Tasmania, 1955–56 : Pp. 69.

In addition to the work reported below, mention is made of trials of varieties of oats, barley, forage grasses, forage legumes, broad beans and tick beans.

Wheat. With the object of combining rust resistance, high yield, good agronomic characters and grain suitable for biscuit flour, 583 pedigree selected lines from 29 crosses were planted in nurseries at the Cressy and Elliott Research Farms and 551 single plant selections of good type and moderate to good rust resistance were isolated from them for further testing. A further series of crosses yielded 27 bulk selections. Varietal trials and baking-quality trials have continued.

Potato. About 84,000 seeds from 49 different crosses were produced at Mt. Pleasant and Tewkesbury and about 15,000 selfed seeds collected. Nearly 8000 of 14,000 seeds from blight-resistant parents were selected in a resistance test for future field trials and a further 3000 seedlings from susceptible parents were planted in a field trial. In the second-year tests, 40 selections out of 195 under trial were retained and in the third-year trial two out of the six tested were retained. Only 78 seeds were obtained after pollination with imported pollen from South Africa, Victoria and New South Wales.

2684 STUBBE, H.
Reinhold von Sengbusch zum 60. Geburtstag am 16.2.1958. (**To Reinhold von Sengbusch on his 60th birthday on 16.2.1958**).
Züchter 1958 : **28** : 1–3.

Some of the plant breeding achievements of

R. von Sengbusch are described on the occasion of his sixtieth birthday.

2685 Hjelmqvist, H.
Botanisk forskning i Lund under ett sekel. (**A century of botanical research in Lund**).
Bot. Notiser 1958 : **111** : 5–33.

An account is given of the work of successive professors of botany at Lund University since the founding of the Botanical Society of Lund in 1858. Genetical research has received much attention since the beginning of the twentieth century.

2686 Grafl, P.
Encore une fois: les hybrides F_1. (**Once again: F_1 hybrids**).
Rev. hort. suisse 1958 : **31** : 49–53.

In this popular article, the advantages of using F_1 hybrid seed are mentioned and methods used in breeding F_1 hybrids are described.

2687 Kupcov, A. I.
(**The asymmetry of variation curves in wild plants under cultivation**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1957 : **116** : 684–87. [Russian].

It is shown that the character of variation curves, representing quantitative characteristics of wild populations of kok saghyz, tau saghyz and other plants in cultivation for industrial uses, changes as a result of selection. With each generation under cultivation, increases in size and acceleration of the life cycle occur. At the same time the markedly asymmetrical variation curves usual in wild forms become transformed into the symmetrical curves characteristic of cultivated varieties.

2688 Chavan, V. M.
The importance of indigenous varieties in plant breeding.
Indian J. Genet. 1957 : **17** : 1–6.

The author considers that the genetic variability of indigenous varieties of crop plants is greater than most plant breeders imagine and that thorough surveys of local material would lead to the discovery of promising strains. A plea is made for the preservation of local varieties under natural conditions to provide pools of valuable genes.

2689 Fyfe, J. L.
Induced mutations and plant breeding.
NAAS quart. Rev. 1957 : No. 38 : 152–56.

General considerations of the means by which ultraviolet radiation, ionizing radiations and chemicals induce mutations and the ways in which such mutations may be used in breeding are discussed.

2690 Mastenbroek, C.
Enkele perspectieven voor de plantenveredeling. (**Some prospects in plant breeding**).
Zaadbelangen 1958 : **12** : 20–21.

The chief topic of this popular article is the use of induced polyploids and mutations in crop breeding.

2691 Smith, H. H.
Radiation in the production of useful mutations.
Bot. Rev. 1958 : **24** : 1–24.

In this short review of the literature, the author considers the types of radiation used and their effects, the problem of the nature of induced genetic changes, factors modifying the effects of radiation and the progress so far achieved in the USA and other countries in inducing mutants of practical value.

2692 Chien, T.-H.
(**How can atomic power be used to improve plant varieties**).
Nung-yeh yen-chiu/Agric. Res., Taipei 1955 : **5** : No. 3–4 : 1–3. [Chinese].

Recent research on radiation-induced mutation is reviewed and the possibilities of improving Taiwan crops by this means are considered.

Work conference on radiation induced mutations sponsored by the Biology Department, Brookhaven National Laboratory, Upton, L.I., New York, May 23 and 24, 1956 :
Pp. 221. (Mimeographed).

The papers read at the conference and supplementary reports included as addenda are abstracted below. Many points of theoretical and practical interest were also raised in the discussions following the papers.

2693 *Shapiro, S. The Brookhaven radiations mutation program.* (*pp. 1–21*).

An account is given of the development of the above programme and of some of the problems receiving attention in numerous cooperative projects. Lists are included which provide information on institutions, material and investigators involved in these projects. The relative merits, in terms of inducing mutations, of constant irradiation of the entire plant at a low dose *vs.* treatment at a higher dose rate for a short period are being evaluated in various species. Study of the effects of subjecting dormant buds of asexually-propagated plants to acute X-ray exposure and to acute irradiation with thermal neutrons generated in the thermal column of the nuclear reactor constitutes another part of the work being carried out in order to determine the best procedures for administering radiation. Yet another part of the programme is concerned with seed irradiation. Experiments by Caldecott have suggested that it may eventually be possible, in the case of thermal neutrons, to correlate a given reduction in seedling height with a maximum frequency of viable beneficial mutations. From the conflicting results obtained with dry and soaked seeds, it appears that optimum moisture content varies according to species. Measures have been taken to standardize the moisture content of all seeds treated by cooperators. Lack of a fixed ratio of sensitivity to X rays and thermal neutrons also points to the need to study each species independently. Investigations by Mertens and Burdick have shown that pretreatment of seeds with calcium nitrate and other salts may increase the frequency of mutations induced by thermal neutrons [201].

2694 *Curtis, H. J. Radiations, their properties, and facilities at Brookhaven National Laboratory. (pp. 22–39).*

The properties of X, γ and β rays and fast and slow neutrons and methods of obtaining these radiations are outlined. Descriptions of the facilities of the γ field, β-ray apparatus and thermal column in the reactor are followed by a discussion of the molecular mode of action of radiations upon biological material.

2695 *Caldecott, R. S. Factors affecting the sensitivity of seeds to ionizing radiations and their significance to the plant breeder. (pp. 43–59).*

This contribution contains essentially the same information as was presented at the United Nations International Conference on the Peaceful Uses of Atomic Energy in 1955 [XXVII, 3755].

2696 *Sparrow, A. H. Cytological changes induced by ionizing radiations and their possible relation to the production of useful mutations in plants. (pp. 76–110).*

In this review the author considers the following: cytoplasmic effect; physiological effects on chromosomes; radiation-induced structural changes; alteration of chromosome number; the possible relationship between chromosome breakage and mutation; the influence of structural changes on phenotype, viability, growth rate and fertility; special uses of radiation-induced chromosome aberrations; changes in radiosensitivity brought about by various external and internal factors; ways in which the frequency of complex aberrations may be reduced relative to the frequency of point mutations; and the influence of polyploidy upon the induction of aberrations and mutations.

2697 *Einset, J. & Pratt, C. Problems and methods of handling irradiated, woody, vegetatively propagated plants. (pp. 114–28).*

The possibility of inducing economically valuable mutants in fruits is discussed with reference to objectives of breeding at the New York State Agricultural Experiment Station, the characters affected by spontaneous mutation, the necessity of having to recover induced mutations from chimeras, and procedures of irradiation and of subsequent handling of the treated material. It is concluded that good techniques of inducing large numbers of bud sports and of recovery and testing have not yet been developed.

2698 *Konzak, C. F. Some procedural problems associated with mutation studies in crop plants. (pp. 132–48).*

With particular reference to cereals, the following problems are surveyed: choice of parental material; factors affecting the reliability of experiments (mixtures, outcrosses and use of controls); the influence of the moisture content and physiological condition of seeds and other plant parts at the time of irradiation; effects of external factors such as chemical pretreatments and the environmental conditions under which the R_1 is grown; type of mutagenic agent; screening technique; and factors determining the feasibility of mutation experiments in breeding.

2699 *Hanway, D. G. A coordinated mutation program with soybeans. (pp. 152–60).*

An account is given of the origin and development of the cooperative programme undertaken by breeders in the north-central region of the USA to study induction of mutations in the soya bean by seed treatment with X rays and thermal neutrons. Information on the experience gained concerning dosages is included. Varietal differences have been noted in susceptibility to damage due to irradiation. Treated material of 14 varieties was grown during 1956 in nine states. Maturity, height, yield and disease reaction are the characters which will receive most attention in studying the progenies of this material. Various systems of pedigree and bulk handling are to be used, depending on the objectives in each state.

2700 *Frey, K. J. Evaluation of the role of radiations in plant breeding. (pp. 163–74).*

Caution in the expectations of breeders using radiation and in the release of publicity concerning the results of applying this technique is advocated. In using radiation, the breeder should not aim at the creation of variability *per se* but the production of a new and extreme type of variability not found in known germplasm. It is suggested that, among asexually-propagated plants, a promising application of the technique may be found among the ornamentals through the induction of novelties. The special problems of mutation breeding include: (1) the possibility of inherent differences within a crop in response to radiation, (2) associated or pleiotropic variability, (3) a tendency of radiation-derived lines to be unstable, as shown by oats, and (4) insufficient information on procedures of breeding in the case of treated material. The view is expressed that the bulk system or some modification of it may be more suitable than the pedigree method. Data on the survival of induced mutants in bulk populations are however required.

2701 *Jodon, N. E. Observations on Magnolia and Rexoro rice grown from irradiated seed. (pp. 188–92).*

X-ray and thermal-neutron treatment have resulted in two early strains of Rexoro and a shorter-strawed form of Magnolia, which may be of value in improving the crop. Viable chlorophyll-deficient mutants and a mutant with black spots on its leaves have also been secured and may be useful for genetical work.

2702 *Mertens, T. R. & Burdick, A. B. On the X-ray production of "beneficial" mutations in quantitative traits. (pp. 193–203).*

Investigations briefly reported elsewhere are described in detail [XXVII, 2383 and XXVIII, 1306].

2703 *Bishop, C. J. Skin color mutations in apples induced by artificial radiation. (pp. 205–11).*

[Cf. XXVII, 2285 and 4310].

2704 *Murray, B. E. Report on the mutation breeding research in the Forage Crops Division. (pp. 212–14).*

The possibility of improving grass and legume species by means of X-ray induced mutations is being explored at the Central Experimental Farm, Ottawa. Creeping-rooted lucerne is being used for the detailed study of techniques of treating stem cuttings, pollen and seed. Progenies from seed of irradiated material of this crop are being screened for mutants for resistance to *Ascochyta imperfecta* and other characters. Ways in which rate of induced mutation is to be determined by making use of genes for male sterility in lucerne are outlined.

2705 *Ouellet, C. E. The influence of X-ray and thermal neutron irradiation of American elm seeds on the germination and early growth of seedlings. (pp. 215–18).*

Data obtained on the above at the Experimental Farm, L'Assomption, Quebec, are reported. The treatments were made with the aim of inducing mutants resistant to Dutch elm disease.

2706 *Currance, T. M. Irradiation of asparagus seeds. (pp. 219–21).*

Preliminary observations on germination, survival and production of abnormal seedlings, as affected by exposure of the seeds to different dosages of X rays and thermal neutrons, have been made at the Department of Horticulture, Minnesota University. It is hoped that mutants with such characters as improved disease resistance, increased diameter of the spears, greater and more uniform vigour, or an easily-recognizable sex-linked marker will be secured.

2707 GRABE, D. F.
Laboratory methods for identification of varieties of soybeans and oats.
Iowa St. Coll. J. Sci. 1957 : **32** : 179–80. (Abst.)

Morphological, physical, physiological and pathological tests used in the identification of 80 varieties of soya bean and 116 varieties of oat are briefly described but no details are given. During the course of the pathological studies, two new races of *Peronospora manshurica* were identified.

2708 ŽUKOVSKIJ, P. M.
(The present position of the problem of the origin of cultivated plants).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 1596–614. [Russian].

Reference is made to the light shed by recent archeological data on the origin of many plant groups. Thus the wheat remains from ancient Egypt contain no trace of *Triticum monococcum.* Since its discovery in 1906, *T. dicoccoides* has been found in a number of different places in the Near East, its centre being apparently in Syria and Palestine; the form from Armenia is distinct in many ways and has been classed as a separate species, *T. chaldicum.* The cultivated emmer found in remains dating from the 5th century BC in south-western Iraq resembles *T. dicoccoides* and this is the wheat that is now thought to have been taken into cultivation in that region, passing thence to Egypt, probably together with *Hordeum spontaneum.* The opinion is further expressed that E. N. Sinskaja has overestimated the role of *Agropyron* and underestimated that of *Aegilops* in the origin of the 42-chromosome wheats; several recent attempts to classify the wheat species are referred to but most of them take no account of the many species of Caucasian wheats found by Soviet investigators, or of the existence there of hexaploid forms of such species as *T. timopheevi*, in which forms with $2n = 14$, 28 and 42 have been found.

The origin of *Secale cereale* as a weed in wheat is now ascribed to Transcaucasia and Asia Minor rather than Central Asia as supposed by Vavilov; the initial species is regarded as *S. segetale*, which has possibly crossed with *S. ancestrale.*

Cultivated maize is thought to have arisen from the wild maize, the remains of which have been found in Mexico [cf. XXVII, 1728] but which later disappeared, probably as a result of grazing.

Outlines are given of the views of Garber on the origin of the sorghums [XX, 2370], Portères on rice [XXVII, 4070], Burkhart and Brücher on *Phaseolus* [XXIII, 3097], Whitaker on gourds [XXV, 1481, XXVII, 922] and Rybin on *Prunus domestica* [VI, 1363].

The conflicting views of Salaman and Hawkes on the one hand and Bukasov on the other concerning the origin of the potato are analysed. The origin of sugar beet is ascribed to chromosome duplication in hybrids of *Beta maritima* x *B. perennis.* The discovery of the probable ancestors of the tomato on the Galapagos Islands is referred to [cf. XXVII, 3547]. The cultivated *Brassica* spp. are regarded as polyphyletic, cabbage and Brussels sprouts having originated from wild *B. oleracea* and cauliflower and broccoli from *B. cretica*, with probable participation of other species such as *B. atlantica* and *B. robertiana*; rape (*B. napus* var. *oleifera*), *B. juncea* and *B. carinata* are regarded as amphidiploids and kohl rabi is thought to have arisen by somatic mutation.

Medicago sativa is regarded as having arisen by allopolyploidy in Mesopotamia; a number of other plants are named as having originated by allopolyploidy, others by autopolyploidy and others by mutation.

2709 Žukovskij, P. M.
(G. I. Tanfil'ev on the geography and history of cultivated plants).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 1354–60. [Russian].

An outline of a book published in 1923 in Odessa is given, attention being drawn to certain interesting viewpoints expressed in it; one of these was that the so-called Hungarian prune had been grown by the Slav populations of the Balkan peninsula many centuries before the advent of the Hungarians; another was that flax originated in western Persia.

2710 Floch, H.
Sur la richesse exceptionnelle en vitamine C de feuilles de plantes guyanaises (manioc, yucca, agave). **[On the exceptional richness in vitamin C of leaves of Guiana plants (Manihot, yucca, agave)].**
J. Agric. trop. Bot. appl. 1957 : **4** : 385–91.

At Cayenne, some local types of *Manihot palmata, M. esculenta, Yucca gloriosa* and *Fourcroya gigantea* were found to have high contents of ascorbic acid: it is thought that some of these plants could be used as a commercial source of vitamin C.

2711 Dolan, D. D.
New germ plasm—the merits and uses of some plant introductions.
Econ. Bot. 1957 : **11** : 244–48.

The work of the USDA plant introduction programme between 1898 and 1957 is discussed. Examples are cited of introductions which have yielded new varieties and sources of disease and insect resistance.

2712 Frankel, O. H.
The biological system of plant introduction.
J. Aust. Inst. agric. Sci. 1957 : **23** : 302–07.

The author outlines the complex process involved when plant introduction is carried out scientifically and emphasizes the need for clear definition of objectives, before introductions are made. Also mentioned briefly are some of the ways by which adaptation of a plant to a new environment may be fostered. It is thought that in searching for sources of introduction, more attention should be given to places where plants are subjected to environmental extremes. For testing introductions, the use of a graded series of controlled environments such as a phytotron provides is advocated.

2713 Stakman, E. C.
Fortschritte und Probleme bei der Schaffung krankheitsresistenter Kulturpflanzen. (**Advances and problems in creating disease-resistant cultivated plants**).
Umschau 1957 : **57** : 737–40.

A general review of breeding for resistance is presented.

2714 Genkel', P. A. & Oknina, E. Z.
(**Diagnosis of frost resistance in plants by the degree of dormancy of their tissues and cells**).
Institut Fiziologii Rastenij im. K.A. Timirjazeva (K.A. Timirjazev Inst. Pl. Physiol.), Moskva 1954 : Pp. 34. [Russian].

One of the criteria of cold resistance offered is the extent to which the tissues of the growing point enter into a state of rest during the winter; the degree of this rest can be judged in woody plants by the amount of fats and lipoids developed in the cells, as revealed by staining with osmic acid or Sudan III. Other criteria are the disappearance of the plasmodesmata, the separation of the cytoplasm from the cell walls, or the type of plasmolysis of the cytoplast by molar solutions of sucrose or KCN. In hardy varieties the lipoids are more stable and withstand temperatures of up to 70° C. whereas those of less hardy varieties may only withstand 40–50° C.

2715 Genkel', P. A.
(**Diagnosis of drought resistance in cultivated plants and methods of increasing it**).
Institut Fiziologii Rastenij im. K.A. Timirjazeva (K.A. Timirjazev Inst. Pl. Physiol.), Moskva 1956 : Pp. 70. [Russian].

An outline is given of a number of methods, direct and indirect, that have been proposed by various investigators for estimating drought resistance. The methods of G. N. Eremeev and L. S. Litvinov, based on the water content of wilted tissues, are criticized as being criteria only of resistance to water loss and not of tolerance also of high temperatures. This latter property can be determined by immersing a leaf in a water bath at a given temperature for 10 min., and transferring to a 0·1 N solution of HCl or HNO_3 and counting the time to the appearance of brown spots. The method recommended is to place cross sections of the plant for 10 minutes in water baths at different temperatures, after which they are treated with a molar solution of sucrose; those that fail to plasmolyse have been killed by the temperature in question. The viscosity of the protoplasm, determined by centrifuging or electrolytically, serves as a criterion of heat resistance within rough limits; another is the bound water content. The tolerance of water loss is measured by estimating the starch content of detached leaves after wilting in the shade for 2–3 hr. or by counting the number of cells surviving after various periods in a desiccator with 1 : 1 H_2SO_4. Estimations made by this last method on a number of spring wheat varieties showed Albidum 43 to be the most resistant to water loss among the bread wheats, the next in order of resistance being Pirotrix and Lutescens 62. In *Triticum durum* the most resistant was Hordeiforme 46–500, followed by Melanopus 69. The varieties of *T. durum* had a higher water-retaining capacity than the soft wheats and were in general more resistant. In respect of resistance to high temperatures Albidum 43 was also the best in the bread wheats and Hordeiforme 46–500 in *T. durum* but some of the other varieties came in a different order from that for resistance to water loss. Within each species the grain yields of the varieties in 1953 and 1954 in the area of Stalingrad were in the same order, with minor exceptions, as their drought resistance as determined by the above two methods; the bread wheats in general gave higher yields than the hard but within them Albidum 43 had the highest and Diamant [Diamond] the lowest; in the hard wheats the highest yields came from Hordeiforme 46–500, Melanopus 69 and Hordeiforme 10, and the lowest from Narodnaja [People's].

A method of hardening against drought, consisting in alternately moistening and drying the seeds before sowing, is described, together with certain physiological and morphological changes that occur in the hardened plants. Not all plants react to this treatment; a list of those that do includes *Medicago sativa* but not *M. falcata*. Transmission of the effects of hardening to succeeding generations is reported in sunflowers; the effects in question included higher yield, peroxidase activity, earliness of bud formation, earliness of maturity, viscosity and elasticity of the cytoplasm, and resistance to high temperatures, lower cell size in the parenchyma and larger xylem vessels.

2716 Hickman, C. J.
Phytophthora—plant destroyer.
Trans. Brit. mycol. Soc. 1958 : **41** : 1–13.

Mention is briefly made of problems concerning the physiological specialization of species of *Phytophthora.*

2717 JUNGES, W.
Die jährliche Niederschlagsverteilung als entscheidender Faktor bei der photoperiodischen Anpassung der Pflanzen. **(The yearly distribution of rainfall as a decisive factor in the photoperiodic adaptation of plants).**
Gartenbauwiss. 1957 : **22** : 527–40.

After examining the photoperiodic requirements of many plants in relation to their distribution it was concluded that with increasing geographical latitude plants adapted to a short photoperiod become relatively less frequent than plants requiring a long photoperiod. Also the photoperiodic adaptation of a plant is influenced by the yearly distribution of rainfall in its native land. In planning plant introductions and hybridization, the above facts may be relevant.

CEREALS

2718 BÄTZ, G.
Über die Anlage und Auswertung von Sortenprüfungen. **(On the design and evaluation of varietal trials).**
Albrecht - Thaer - Arch. 1957 : **2** : 239–309.

In this survey of trials of winter wheat and winter rye carried out in the German Democratic Republic during 1952–54, a discussion of the effects of plot size and shape, fertilizer treatment, preceding crop, sowing time and sowing density upon the results of individual varietal trials and of the influence of locality on the results of trial series, is followed by recommendations for the design of individual and serial trials. In the evaluation of series of trials three methods of analysis are compared: (1) a simple comparison of the mean varietal values in each trial; (2) the ranking of varieties according to the frequency with which they fall into one of five yield classes; and (3) analysis of variance. The last method was the most informative, giving an accurate evaluation of experimental error and an indication of interactions between varieties and ecological factors.

2719 **Report of the fifth FAO meeting on wheat and barley breeding in the Near East, held in Teheran, Iran, 8–15 June, 1957.**
FAO UN, Rome 1957 : Mtg. Rep. No. 1957/12 : Pp. 26. (Mimeographed).

Short summaries of the discussions held at the above meeting are provided. It was evident from the progress reports that in nearly all countries extensive use has been made of varieties and types collected within the individual countries concerned and the Near East as a whole, as well as of introductions from FAO, the US Department of Agriculture and other agencies. Programmes of selection and hybridization are now under way in most of the countries. The value of the cooperative uniform wheat and barley nurseries in discovering varieties with disease resistance and other desirable characters, for immediate use or in breeding, was emphasized. The future of these nurseries was considered and agreement reached on their continuation. Other topics discussed in terms of future plans included: cooperative yield trials of wheat and barley; cooperative survey of races of the wheat rusts; nursery and laboratory testing for resistance to rusts, smuts and other diseases, insect pests, unfavourable climatic conditions and soil salinity and alkalinity; problems of quality, in particular, yellow berry in durum wheat; the use of herbicides, fungicides, insecticides and fertilizers in relation to breeding; procedures in breeding; a training centre on breeding; sharing the maintenance of the world barley collection among different countries; and naming new varieties.

2720 **Cereal news from other countries.**
Cereal News 1957 : **3** : No. **3** : 25–31.

Wheat. The development in England of ALG42, a hard red winter wheat able to withstand temperatures of — 35° C., is noted. Ridley, an Australian variety, has shown seedling resistance to races 15, 21, 21–A, 34, 40, 75 and 194 of *Puccinia graminis* var. *tritici* in India although it is susceptible to these races and to races 15–C and 122 when adult. The release of Aotea in New Zealand [cf. 1367 and 1470] and Columbia in Oregon and Washington [cf. XXVII, 2650] is also mentioned.

Oats. The release of Kent in Australia is noted [cf. XXVII, 3957]. Lanark, introduced from Canada, has performed well at three localities in Kenya but is attacked by stem rust at 7000 feet.

Barley. In Sweden two radiation-induced mutants, both with short straw and one early maturing, are being multiplied for commercial use.

Bean. Mention is made of the release of Columbia Pinto in Washington and Idaho.

2721 BJAANES, M.
Framtidsperspektiver i kornforedlinga. **(Future prospects in cereal breeding).**
Samvirke 1958 : **53** : 139–43.

In this survey of cereal breeding problems in

Norway, special reference is made to the need for increased stiffness of straw in spring wheats. At Møystad, improvement in the straw stiffness of the early and exceptionally high-yielding variety Norrøna is being attempted by crossing with the stiff-strawed varieties Svenno and Drott [King] and others and by artificial induction of mutation by means of neutron irradiation. The barley Domen is also being irradiated with the aim of improving its tillering capacity.

2722 VESTERGAARD, W.
Abed Planteavlsstation. (**Abed Plant Breeding Station**).
Planteavl. Loll.-Falster. 1957 (1958) : 3–14.

Wheat. A promising, fairly short and stiff-strawed type has been developed from a cross between a Norwegian mildew-resistant spring wheat and Jonquois. Weihenstephaner I and Dreadnought, which have shown resistance to leaf diseases, and the high-yielding variety Cappelle are being used as breeding material.

Oats. The new variety Max gave the highest grain yield in trials held in 1953–56 [cf. XXVII, 1211]. Some particularly strong-strawed lines of Max and Palu have been developed.

Barley. In trials held in 1953–56, the highest yield was given by Bonus, closely followed by the slightly less stiff-strawed varieties Sejet 1732 and Sejet 1722. Crosses involving the high-yielding Netherlands barley Minerva, and Bonus, Proctor, Strengs 3 and Abed 7–95 are now in the F_3 generation.

Tweede jaarboekje van de Stichting Nederlands Graan-Centrum 1957. (**Second yearbook of the Netherlands Cereals Centre Foundation, 1957**). Pp. 112.

2723 *Meppelink, E. K. De bakkwaliteit van de in Nederland verbouwde tarwerassen: oogst 1956. (The baking quality of wheat varieties grown in the Netherlands: 1956 harvest). (pp. 39–51).*

Data on the baking quality of 10 winter and 4 spring wheats are presented.

2724 *Het onderzoek op graangebied in 1957. (Research on cereals in 1957). (pp. 56–86).*

The projects undertaken by the Netherlands Cereals Centre are briefly noted and include studies of varietal differences in resistance to cold, heat, drought, excess precipitation, sprouting in the ear and fungal diseases, the improvement of baking quality in wheat and attempts to increase the fodder value of rye. Colchicine-induced tetraploid ryes and a wide range of crosses of wheat, wheat x rye, oats and barley are being studied.

2725 BRUYÈRE, R.
Céréales d'altitude. (**Cereals for high districts**).
Bull. INÉAC 1958 : **7** : 53–65.

A brief survey is presented of the breeding of wheat, maize and *Eleusine coracana* carried out at the Experimental Station of Kisozi in the Belgian Congo. Attempts are being made to produce an awnless wheat of good baking quality; information is given on the productivity of some recent lines. Crosses have been made between early maize varieties to produce a type with a short vegetative period. The characteristics of the two principal types of *E. coracana* cultivated in Ruanda-Urandi are listed; details are provided on the yielding capacity of the best lines selected at Kisozi.

2726 **Cereal news from Canada.**
Cereal News 1957 : **3** : No. **3** : 11–24.

Wheat. Some lines from the crosses H46133 x Kendee and *Triticum* x *Agropyron* showed superior sawfly resistance, with only 8% to 10% damage at Lethbridge, Alta.

Oats. Line 5055–13 (Garry x Mutica Ukraine 2x Abegweit) has continued to show promise at Charlottetown and in the Eastern Cooperative Oat Test, especially in respect of yield and straw strength, although it is 10 days later maturing than is desirable.

In the search for resistance to new races of *Puccinia coronata*, at Ottawa, a line of *Avena byzantina* has been found in which some plants possess resistance to the "Landhafer races". Magnif 28 and 29 from Uruguay also possess resistance to these races and to all other races found in that part of South America but all three lines are susceptible to *Helminthosporium victoriae*. A promising cross has been obtained between *A. strigosa* 'CD3820' and *A. sativa*.

At Winnipeg an attempt is being made to separate the putative B and C genes for stem rust resistance and the rust reaction of F_3 lines from crosses between Garry and susceptible varieties are under observation.

Barley. Interspecific *Hordeum* hybrids have been found at Ottawa to vary in their reaction to colchicine treatment.

2727 STRAND, E.
Kornsorter og annet aktuelt når årets korndyrking planlegges. (**Cereal varieties and other topical matters concerning the planning of cereal cultivation**).
Samvirke 1958 : **53** : 127–29.

The results of recent trials of barley, oats and spring wheat in south-eastern Norway are presented and used as a basis for recommending varieties suitable for various purposes and districts.

2728 CURTIS, B. C. & CROY, L. I.
The approach method of making crosses in small grains.
Agron. J. 1958 : **50** : 49–51.

Details are given of the approach method, as applied to wheat at Oklahoma State University of Agriculture and Applied Sciences. The upper and lower spikelets and third florets of the ear of the ♀ parent were removed, the upper one-third of the glumes of the remaining florets being clipped so that the pollen could fall directly on to the stigmas. The ear was then placed slightly below an ear of the ♂ parent and both were covered with a bag made from dialysing tubing. The ♀ ear may be held in place by fastening its peduncle to the stem of the ♂ spike with paper-covered wire. The awns were removed from the ♂ spike for ease in inserting into the bag. As many as five ♀ ears may be placed in a bag with one ♂ ear. Use of this technique, which is most applicable under greenhouse conditions, resulted in a seed set of 44·9% in 1956, as against 10·1% for the usual method. The approach method has also raised the percentage of seed set in oats. Clipping off a part of the glumes causes a slight reduction in seed size, which should not however be a disadvantage under ordinary conditions of sowing.

2729 VUYST, A. DE, VERVACK, W., VANBELLE, M., ARNOULD, R. & MOREELS.
La composition en acides aminés des céréales belges et leur valeur dans l'alimentation du porc et de la volaille. (**The composition in aminoacids of some Belgian cereals and their nutritive value for pigs and poultry**).
Agricultura, Louvain 1958 : **6** : 19–53.

Information is provided on the aminoacids present in protein from a series of varieties of wheat, rye, oats, maize and barley.

2730 VALLE, O., SINISALI, J., HONKAVAARA, T., KAARTINEN, H. & RINNE, U.
Keskustelu viljanviljelyä koskevan alustuksen pohjalla Agronomien Yhdistyksen syyskokouksessa 24.11.1956. (**Discussion of a report on cereal cultivation at the autumn meeting of the Agricultural Association, 24.11.1956**).
Maatalous 1957 : No. 2 : 21–28.

In the course of a general discussion on the cultivation of wheat, rye, oats and barley by O. Valle, T. Honkavaara, H. Kaartinen and U. Rinne, based on a report by J. Sinisalo, reference is made to the performance of different varieties in various parts of Finland, and to their suitability for mechanized harvesting.

2731 KINBACHER, E. J.
Laboratory and greenhouse research on cold-resistant cereal varieties.
Fm. Res. 1958 : **24** : p. 7.

The hardening and freezing chambers at Ithaca, NY, and their use are briefly described in this popular article.

2732 PARMENTIER, G.
Étude expérimentale sur la stabilité des races physiologiques d'*Erysiphe graminis* (D.C.). [**An experimental study on the stability of the physiological races of *E. graminis* (DC.)**].
Parasitica, 1957 : **13** : 50–63.

In studies of monospore cultures of different races of wheat and barley mildew, repeated conidial multiplication and passage through varieties differing in resistance did not result in any modification of virulence.

2733 GUYOT, L. & MASSENOT, M.
Observations et expérimentations sur la rouille noire des céréales et des graminées au cours des années 1954 à 1956. (**Observations and experiments on black rust of cereals and grasses during the years 1954 to 1956**).
Ann. Inst. nat. Rech. agron., Paris 1957 : **8** : 271–303.

The incidence of different physiological races of *Puccinia graminis* on wheat, oats, barley, rye and various grasses in France and parts of North Africa and Spain is recorded. At Grignon, the reaction of a wide range of European wheats and American introductions to the different physiological races was determined. Race 21 appeared to be the most prevalent on wheat; new biotypes of race 75 and race 186 were found.

2734 Owen, H.

Physiologic specialization in *Rhynchosporium secalis*.

Trans. Brit. mycol. Soc. 1958 : **41** : 99–108.

British isolates of *Rh. secalis* from barley, rye, *Hordeum murinum* and *Agropyron repens* have been found to show strict host specialization but this is not correlated with morphologcial differences in the spores. Isolates from *A. repens* could be distinguished by their flatter growth and absence of dark pigment in culture.

WHEAT

2735 Kramer, A. I.

(Winter wheat varieties valuable for the Stavropol' territory).

Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 5 : 44–45. [Russian].

Odessa 3 and Odessa 16, both from the Institute of Breeding and Genetics, outyielded Vorošilovskaja in the steppe districts, Odessa 16, in addition, possessing better baking and milling properties and showing improved resistance to *Puccinia*. Bezostaja 4 [Awnless 4], Skorospelka 3 [Early 3] and particularly the improved Skorospelka 3B, all originating from Krasnodar, were more productive than Novoukrainka 83 in the mountainous districts.

2736 Fajersson, F.

Tre decenniers vårveteförädling—ett bokslut och en blick framåt. (**Three decades of spring-wheat breeding—a balance sheet and a glance ahead**).

Weibulls Årsb. Växtföräd. Växtodling 1958 : **53** : 15–20.

Of the six varieties developed at Weibullsholm Plant Breeding Institute since spring-wheat breeding was begun there some 30 years ago, Svenno and Kärn II [Kernel II] now account for about 90% of the area under spring wheat in Sweden. Current breeding objectives include greater earliness and disease resistance.

2737 Forsøg med Hvedesorter 1953–1957. (**Trials of wheat varieties, 1953-1957**).

Tidsskr. Frøavl 1958 : No. 546 : 326–28.

Details of the yield, grain and straw characters, winter hardiness and earliness are given for nine varieties tested at several stations in Denmark.

2738 Shen, T. H. & King, Y. K.

Spring wheat production in Taiwan.

Agron. J. 1958 : **50** : 92–94.

Information is provided on varieties suitable for spring-wheat production in Taiwan. It is mentioned that breeding rust-resistant strains by back crossing Taichung 32 and Taichung 31 with Timstein, Newthatch and Thatcher has been in progress with promising results.

2739 Pimentel, H.

Variedades de trigo e épocas de plantio aconselháveis no Estado do Paraná. (**Wheat varieties and dates of planting recommended for the State of Paraná**).

Circ. Inst. agron. do Sul 1956 : No. 5 : Pp. 27.

An outline is given of the wheat-breeding work carried out at the experimental station at Ponta Grossa in Brazil. Introductions from every part of the world where wheat is grown have been tested. The wheat PG1 has given good results both in cultivation and in crosses with other varieties; it is a selection of Polisú, a local variety which has figured in the parentage of a number of later wheats, including Surpresa [Surprise], Guaraní, Fronteira [Frontier], Rio Negro, Bagé, Patriarca [Patriarch] and Frontana. The most suitable varieties for cultivating in different parts of the State of Paraná are indicated; these are, for the southern and eastern zones, Trintecinco [Thirty-five], PG1, Alegrate, Colônias, Combate, Trapeano and Frontana and for the southern zone Bandeirante and Frontana. Regional tests in 1951–53 show very regular yields from the hybrid H-40-33-23, with a mean yield of 947 kg. per ha. for the period; this hybrid is recommended for areas where PG1 has previously been grown.

2740 Schlehuber, A. M.

Wheat quality in North America.

Cereal Sci. today 1957 : **2** : 246–49, 264.

Progress made in breeding hard bread wheats in Canada and the USA since the introduction of Turkey in 1873 is surveyed. A number of varieties recently released are mentioned and reference made to results expected from *Agropyron* x *Triticum* crosses. The problem of breeding for resistance to stem rust, especially race 15B, is discussed in some detail and the importance of testing for quality at an early stage in a breeding programme is emphasized.

2741 Čžo, Ju.-Š. [Cho, Y.-S.], & Czjan, Ju.-Ju. [Chiang, J.-J.]

(Increasing the vitality of wheat by intervarietal crossing).

Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 8 : 13–17. [Russian].

The standard variety of winter wheat for the

Peking area, 1885, was sown together with a number of rows of another variety and allowed to interpollinate, some ears being emasculated and others not. The grains from the ears that were not emasculated had a higher 1000-grain weight than those from emasculated ears and those from control plants of variety 1885 sown alone. The plants arising from the crossed grains were slightly better than the control in vigour, winter hardiness and yield, which in certain cases was as much as 66·88% higher; in this generation the progeny of the emasculated plants was better in yield than that of the unemasculated but showed more segregation; however, only 11% of plants deviating from the maternal type occurred.

2742 Mathon, C.-C. & Stroun, M.
À propos d'essais de croisements entre *Triticum timopheevi* et *Triticum turgidum compositum.* **(Concerning attempts at crosses between *T. timopheevi* and *T. turgidum compositum*).**
Bol. mens. Soc. Linn. de Lyon 1955 : **24** : 235–41.

Hybrids have been obtained (*a*) by pollinating plants from *T. timopheevi* embryos grafted on to endosperms of *T. turgidum* var. *compositum* with pollen from normal *T. turgidum* var. *compositum* plants and (*b*) by pollinating plants from *T. turgidum* var. *compositum* embryos grafted on to *T. timopheevi* endosperms with pollen from the reverse graft.

2743 Fukasawa, H.
Studies on restoration and substitution of nucleus (genome) in *Aegilotricum*, IV. Genome exchange between *durum* and *ovata* cytoplasm and its theoretical consideration for male-sterility.
Cytologia, Tokyo 1957 : **22** : 30–39.

Aegilotricum ♀ (amphidiploid between *Aegilops ovata* ♀ and *Triticum durum*) x *Ae. ovata* was successively back crossed to *T. durum* ♂. After four back crosses, plants with 14_{II} of *T. durum* were obtained. As in a previous experiment on the introduction of *T. durum* genomes into the *Ae. ovata* cytoplasm of *Aegilotricum*, the 14_{II}-individuals were completely pollen sterile [cf. XXIV, 2817]. The restoration of *Ae. ovata* genomes in *Ae. ovata* cytoplasm derived from *Aegilotricum* was also carried out, as in the earlier investigations. This restoration was achieved after three back crosses, the 14_{II}-plants being normal in pollen fertility.

Complete substitution of the genomes of *T. durum* in *Ae. ovata* cytoplasm originating from the pure species was effected by means of four back crosses. The 14_{II}-derivatives were completely pollen sterile.

In plants with *T. durum* genomes in *T. durum* x *Ae. ovata* or the amphidiploid of this combination, pollen fertility equalled that of normal individuals of *T. durum.*

Ae. ovata genomes were restored in the cytoplasm of male-sterile plants of *T. durum* with *Ae. ovata* cytoplasm after three back crosses. Pollen fertility in the 14_{II}-plants was as high as 96·1%.

Finally, *Ae. ovata* genomes were substituted in *T. durum* cytoplasm as the result of five back crosses. Pollen fertility in the substitution plants ranged from 0·45 to 95·58%. Some individuals with low pollen fertility had 13 completely paired bivalents and one incompletely associated bivalent; substitution in such cases was therefore still incomplete. Some of the plants with 14 completely paired bivalents had slender leaves and culms and decreased plant height in comparison with normal individuals of *Ae. ovata*; substitution in such derivatives may also have been incomplete, possibly as the result of rarely-occurring crossing over between the chromosomes of the two species. Most of the plants with 14 complete bivalents were however normal in growth and almost normal in pollen fertility.

It is therefore concluded that the male-sterile condition of *T. durum* possessing *Ae. ovata* cytoplasm probably has its origin in the cytoplasm of the latter species; the possibility that *Ae. ovata* contains a nuclear gene which renders the male-sterile component inactive also requires consideration [cf. XXVI, 2184].

2744 Rusmini, B.
Descrizione di un ibrido *Triticum vulgare* x *Secale cereale.* **(Description of a *T. vulgare* x *S. cereale* hybrid).**
Ann. Sper. agr. 1958 : **12** : No. **1** : Suppl. : xvii–xx.

The hybrid described is a stable amphidiploid obtained by colchicine treatment of one plant produced in 1948 from the cross *T. vulgare* 'Est Mottin' x *S. cereale* 'Ottavi'. Its morphological characters and those of its parents are tabulated and its agronomic characters briefly described. Since it possesses good resistance to diseases and adverse conditions it is thought to be of some interest as genetic material.

2745 Rusmini, B.
Ibridi *Triticum* x *Agropyron* e loro reincroci. (***Triticum* x *Agropyron* hybrids and their back crosses**).
Ann. Sper. agr. 1958 : **12** : No. 1 : Suppl. : i–xvi.

Studies of the behaviour of five generations of progeny from crosses between *T. turgidum*, *T. polonicum* and *T. vulgare* 'Damiano' and 'Mentana' on the one hand and *A. glaucum* on the other are reported and the general observation is made that, while no lines with satisfactory yield and quality of grain have been developed, the selection of some lines useful for fodder production has been possible. Back crossing to varieties of *T. vulgare* has been carried out in some cases. The back cross progeny of *T. vulgare* 'Mentana' x *A. glaucum* showed improved fertility, rust resistance and earlier maturity, those of *T. turgidum* x *A. glaucum* were rust resistant but less fertile and later in maturity, while those of *T. polonicum* x *A. glaucum* were little different from the single-cross progeny. Tables are included showing the fertility, seed viability, disease rating and other characteristics of progeny from a number of back crosses.

2746 Meletti, P.
Sulla presenza del "Denti de Cani" in Calabria. (**On the presence of Denti de Cani in Calabria**).
Nuovo G. bot. ital. 1956 : **63** : p. 155.

The cereal variety Denti de Cani [Dog's Teeth], believed to be an allopolyploid between a tetraploid *Triticum* and a wild diploid grass, was first reported from Sardinia [XXVI, 317]. The present article reports its presence in fields of *T. durum* in Calabria, associated also with *Haynaldia villosa*.

2747 Gaponenkov, T. K. & Porojskaja, S. M.
(**Influence of vegetative and sexual hybridization of hard spring wheat on the chemical composition of the grain**).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 9 : 16–18. [Russian].

A vegetative hybrid obtained by grafting the embryo of *Triticum durum* 'Melanopus 69' on to the endosperm of *T. carthlicum* exceeded the parents and the sexual hybrids between them in grain yield and content of protein, gluten and starch. Thus its protein and starch yields were 369 c. and 1329 c. per ha. compared with 286 c. and 1166 c. in the sexual hybrid, 241 c. and 938 c. in Melanopus 69 and 328 c. and 969 c. in the standard variety Narodnaja [People's]. The photosynthetic activity of the leaves was greater in the vegetative hybrid, which was also more resistant to fungous diseases and insect attack.

2748 Innamorati, M.
Cromosomi somatici in cariossidi dure e tenerizzate di *Triticum durum*, Desf. (**Somatic chromosomes in hard-grained and soft-grained derivatives of *T. durum* Desf.**).
Caryologia 1958 : **10** : 450–53.

Soft-grained derivatives obtained from a hard-grained variety, Bidi, by directed training at the Institute of Agronomy, Perugia, Italy, did not show any change from the parental chromosome number of $2n = 28$ [cf. XXII, 2608].

2749 Miržinska, J., Penčić, M., Popović, L. & Sarić, M.
Proučavanje medjusortnog ukrštanja pšenice slobodnim oprašivanjem. (**Investigation on intervarietal crossing of wheat by open pollination**).
Arh. poljopr. Nauk. 1957 : **10** : No. 28 : 50–84.

A series of hybrids was obtained at Kruševac and Zemun Polje by growing mother plants of one variety between rows of one or more pollinating varieties. The seed parent was emasculated when the ears emerged. Morphological analyses of the progeny showed that in most cases the characteristics of the seed parent predominated in the F_1 and subsequent generations. Great variability however was observed among all progenies, from the F_1 onwards. Some F_1 and F_2 plants differed morphologically both from the maternal and paternal parents. Some hybrids had larger grain than the seed parent, ripened earlier, were hardier and showed improved resistance to lodging, rust and smut. Some hybrids were more productive than the seed parent. This was the case when a "biologically older" variety was employed as the female parent and was fertilized by pollen from varieties with a high yield. The high yield observed in some hybrids gradually diminished from the F_2 to F_6.

2750 Bieri, R.
Die Umwandlung von Winterweizen in Sommerweizen. (**The conversion of winter wheat into summer wheat**).
Schweiz. landw. Mh. 1958 : **36** : 27–29.

Lysenko's claims to have changed the habit of cereals are surveyed with reference to criticisms of his work by Skripčinskij [XXV, 2899] and Stubbe [XXVI, 1146].

2751 MANZJUK, V. T.
(Efficacy of selection in connexion with the method of raising the seedlings of spring-wheat hybrids).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 9 : 19–22. [Russian].

Seed of two hybrids of *Triticum durum*, Har'kov 46 x Dlinnokolosaja 120 [Long-eared 120] and Melanopus 69 x Dlinnokolosaja 120, gave rise to F_1 generations in which the grain yield per plant was 2·93 g. and 1·88 g. per plant respectively; after selection on irrigated ground with good manurial dressings the yield was raised in the F_3 to 5·24 g. per plant in the former hybrid and 3·35 g. in the latter, whereas selection carried out without irrigation and manuring led to little or no improvement. In the F_4 the yield was raised to 11·5 g. per plant in the former hybrid in families selected on irrigated ground and the best selections exceeded Har'kov 46 by 25·2%, whereas in the F_2 they had been inferior to it by 11·9%.

2752 Winterweizen Hadmerslebener Qualitas.
(The winter wheat Hadmerslebener Qualitas).
Dtsch. Landw., Berl. 1958 : **9** : p. 45.

This variety, developed from a cross between Carsten VI and Rimpaus Braun [Rimpau's Brown], produces small grain of high baking quality. It is winter hardy, resistant to *Puccinia glumarum*, equals Hadmerslebener IV in yielding capacity and is suitable for combine harvesting.

2753 NEČIPORENKO, N. A.
(Breeding and seed production in Soviet Kazahstan).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 5 : 16–22. [Russian].

New high-yielding varieties of spring wheat from Šortandy include (1) the drought resistant soft wheat Šortandinka [wheat from Šortandy], obtained by crossing Akmolinka 1 [wheat from Akmolinsk 1] with another local variety, and (2) Akmolinka 5, a hard wheat selected from Beloturka. The latter selection is early and tolerant of spring frosts and drought in summer and outyields the standard Hordeiforme 189 by 25%. Snegurka [Snow Princess], a spring variety from a cross between unspecified spring and winter wheats, has reached the trial stage; it is highly productive of large grain and resistant to drought, lodging and shedding.

2754 KORPINEN, E.
Kevätvehnälajikkeiden tuntomerkeistä. **(Some characteristics of spring-wheat varieties).**
Maataloust. Aikakausk. 1956 : **28** : 84–89.

A key to the identification of 25 spring wheat varieties cultivated in Finland during the past 20 years is given, drawn up as a result of the work of the seed-testing station at Helsinki.

2755 FAJERSSON, F.
Weibulls Original Eroicavete II i jämförelse med Eroica. **(The Weibull original wheat Eroica II compared with Eroica).**
Agri. hort. genet., Landskrona 1957 : **15** : 214–22.

In trials held during 1945–57, Eroica II proved superior to Eroica in winter hardiness but was equal in yield, quality, and other characters.

2756 FAJERSSON, F.
Weibulls Winterweizen Ertus, ein Ergebnis Schwedischer Qualitätszüchtung. **(The Weibull winter wheat Ertus, a result of Swedish breeding for quality).**
Agri hort. genet., Landskrona 1957 : **15** : 223–32.

Detailed information is given on the hectolitre weight, protein content, gluten content, viscosity, baking and milling quality and yield of the above variety [cf. XXIII, 1848].

2757 MARIANI, M.
La coltivazione di frumenti duri nella Cirenaica settentrionale. **(The cultivation of hard wheats in northern Cyrenaica).**
Riv. Agric. subtrop. 1957 : **51** : 438–46.

Brief descriptive notes are included concerning 13 varieties, of which Bidi and Senatore Cappelli are the most popular.

2758 KERBER, E. R.
A brief history of durum wheat production in Western Canada.
Cereal News 1957 : **3** : No. 3 : 6–10.

Changes in the variety situation in western Canada since 1920 are discussed with reference to grain quality and rust resistance, the most important external factors influencing the choice of varieties.

2759 Morozov, P. V.
(An experiment on selecting a red-grained form from the wheat Moskovka).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 5 : p. 68. [Russian].

This account of selection of a red-grained form of Moskovka [wheat from Moscow] is substantially the same as that already summarized [XXVII, 2787]. It was found that the red-grained form equals the initial variety in baking quality and is more productive. Breeding work with the new variety is being continued and includes its improvement by intravarietal crossing and single-plant selection.

2760 Heyne, E. G.
Earl G. Clark, Kansas farmer wheat breeder.
Trans. Kans. Acad. Sci. 1956 : **59** : 391–404.

An account is given of the characteristics of the winter wheats bred by E. G. Clark, the extent of the use of these varieties in Kansas during the period 1919–56, their origin and the breeding procedures used. The varieties comprise Blackhull, Superhard, Clarkan, Kanhull, Chiefkan, RedChief, BlueJacket, MoKing, KanQueen, RedJacket, NewChief and KanKing. The breeding of all these varieties was based on Turkey. The author suggests that Clark had a fairly wide range of genotypes available for selection as the result of the mixed nature of the original Turkey material and natural hybridization. The procedure of repeatedly selecting the different types and compositing them into bulks, combined with the likelihood of volunteer plants in an area where summer fallowing is not practised and wheat follows wheat, provided ample opportunity for natural crossing. Clark's method is regarded as essentially similar to the procedure of recurrent selection proposed for maize by Hull. The method has been effective in accumulating genes for stiff straw and high test weight but the limitations of such a narrowly based system are shown in the case of earliness, smut resistance and gluten strength, genes for which were absent or present only with low frequencies. Two other features of Clark's procedure, viz. delayed harvesting and severe weed competition, intensified selection for stiff straw, nonbleaching and nonshattering.

2761 Oppenheimer, H. R.
Wild emmer—its discovery by A. Aaronsohn, fifty years ago, and its importance for the origin of cultivated wheats.
Svensk bot. Tidskr. 1957 : **51** : 545–51.

A short account of Aaronsohn's life, his discovery of *Triticum dicoccoides* in the Near East and the possible role played by this species as a progenitor of the tetraploid and the hexaploid wheats is presented.

2762 Hjelmqvist, H.
Fynd av vete från Skånes tidigneolitiska tid. **(Wheat finds from the early neolithic period in Skåne).**
Bot. Notiser 1958 : **111** : 399–400.

Three finds of wheat impressions on early neolithic potsherds in Skåne, Sweden, are reported. The oldest specimen was identified as *Triticum compactum* while the later ones pertained probably to the same species but possibly to common wheat.

2763 Crosby, A. R.
Nucleolar activity of lagging chromosomes in wheat.
Amer. J. Bot. 1957 : **44** : 813–22.

Study of the monosomic series of *Triticum vulgare* indicated that the formation of micronuclei is not dependent on the presence of a nucleolus. Monosomics I, X, XIV and XVII showed nucleolar activity in their micronuclei. No evidence of nucleolar function was found in the case of the remaining 17 chromosomes. The telocentric for the short and secondarily-constricted arm of chromosome X possessed the same degree of nucleolar activity as the corresponding normal chromosome, whereas the isochromosome for the short arm of X showed twice this activity. Counts of the numbers of nucleoli in tetrasomics and observations on diacinesis in monosomics confirmed that I, X, XIV and XVIII are nucleolar chromosomes. It is suggested that in general both nucleolar and nonnucleolar chromosomes may be involved in the formation of nucleolar material, the size of the nucleolus depending upon the numerical relationship between the nucleolar and nonnucleolar chromosomes.

2764 Georgiev, G. N. & Nikolov, H.
(Amitotic division during embryo and endosperm development in the embryo sac of wheat).
Naučn. Trud. Selskostopan. Akad. Georgi Dimitrov Agronom. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1957 : **4** : 39–54. [Bulgarian].

Four different kinds of amitoses in developing endosperm of the wheat variety **14** were observed. Only one kind, namely the development of one nucleus within another, occurred also in the embryo. This kind of amitosis was the sole method of division of the embryonic cells till the radicle outgrew the coleorhiza.

2765 AVANZI, S. & CHIARUGI, A.
Osservazioni preliminari sugli effetti fisiologici e citogenetici della irradiazione di semi di grano duro "Cappelli" con raggi X e neutroni termici. **(Preliminary observations on the physiological and cytogenetical effects of irradiation of seed of the hard wheat 'Cappelli' with X rays and thermal neutrons).**
RC Accad. Lincei Ser. 8 : 1957 : **23** : 158–65.

Both types of radiation were found to cause chromosome aberrations, details of which are presented in table form.

2766 STEINITZ-SEARS, L. M. & SEARS, E. R.
Ultraviolet and X-ray induced chromosomal aberrations in wheat.
Genetics 1957 : **42** : 623–30.

Studies of the progeny of X-irradiated and ultraviolet-irradiated pollen have shown that reciprocal translocations and part and whole chromosome deficiencies follow both treatments but that more of the ultraviolet-induced translocations were deficient for an apparently terminal segment. This is regarded as evidence for less reunion and more healing of broken chromosomes following ultraviolet treatment. It is also concluded that the data suggest that dicentric chromosomes are seldom lost in this material but instead often break and give rise to chromosomes with terminal deficiencies.

2767 WELLINGTON, P. S. & DURHAM, V. M.
Varietal differences in the tendency of wheat to sprout in the ear.
Emp. J. exp. Agric. 1958 : **26** : No. 101 : 47–54.

Sprouting in the ear was found to occur more readily in varieties with white grains than in varieties with red grains, under optimum conditions for sprouting at Cambridge, England, although differences were observed within both groups, especially in the case of the white-grained varieties.

2768 HOROVITZ, N. & COVAS, G.
Trigos superprecoces para la región semiárida central de la Argentina. **(Extraearly wheats for the semiarid central region of Argentina).**
Idia 1957 : No. 112 : 14–16.

In a preliminary trial at the Anguil Experiment Station, Las Pampas, Argentina, six F_6 lines from (Magnif G x Magnif Entrerriano) x {[(Magnif G x Sinvalocho MA) x Sinvalocho MA] x Magnif G} matured within 60 days from germination, about two weeks earlier than six early commercial varieties sown at the same time on 2 September 1956. With later sowing the maturation period of the bred lines decreased while most of the commercial varieties failed to head. The bred lines also outyielded the commercial varieties and work on the improvement of their quality is in progress.

2769 MAKSIMČUK, L. P.
(Inheritance of length of vegetation period in cereals).
Bot. Ž. (Bot. J.) Moskva 1957 : **42** : 1232–41. [Russian].

In 30 different crosses between early and late varieties of wheat the time of earing of the F_1 was later than that of the earlier parent by intervals varying from 17–40 days, when the two were grown under identical conditions. Some inaccuracies of T. D. Lysenko in referring to these experiments are pointed out.

In three crosses between spring and winter wheats the F_1 hybrids were 11–26 days later than the spring parent in maturity, the F_2 plants were 4–11 days later and the F_3 1–16 days later. In heading date the F_1 plants were 11–16 days later than the earlier parent and the F_2 4–5 days later; the F_3 plants were equal to the earlier parent.

Comparisons of the F_1, F_2 and F_4 plants of three crosses all sown together and grown under the same conditions showed that the F_1 matured 11–14 days later than the earlier parent in one cross, 8–10 days later in another and 4–15 days later in the third. Whereas the early parent did not react to vernalization the F_1 eared 5–6 days earlier after vernalization. The F_2 plants segregated for time of maturity, and were 4–16 days later than the earlier parent; some of the F_4 plants came into ear at the same time as the early parent. Moreover in both the F_2 and F_4 generations there were plants which matured 7–9 days before the F_1.

It is pointed out that in all these crosses the late parent was one in which both phases of vernalization were long and the early parent was one in which both were short; this may account for the lack of agreement between these results and those of Lysenko. No F_1 generation was later than the later parent.

In millet crosses a number of F_1 generations were earlier than the early parent or later than the late parent. In other crosses the F_1 was later than the early parent by amounts varying from 4 to 17 days.

The results of the experiments described lend no support to the thesis of Lysenko and Prezent that selection can be carried out on the basis of the behaviour of the F_1 generation and several cases are cited where valuable varieties have been produced by selection in the later generations of breeding.

2770 Schmalz, H.
Der Einfluss alternierender Kurztag- und Dauertag-Perioden verschiedener Länge auf die generative Entwicklung einiger Sommerweizenformen. (**The influence of alternating short-day and continuous day periods of different length on the generative development of some types of spring wheat**).
Z. Pflanzenz. 1958 : **39** : 97–112.

Four spring wheats with various photoperiodic requirements were subjected to alternating photoperiods of 24 and 10 hours; in three experiments the change in treatment took place at intervals of one, three and seven days. The shorter the duration of the alternating treatments, the more retarded was the development of the ears and growing point in all the varieties studied.

2771 Poliščuk, V. K.
(**Promoting the resistance of winter wheat to different diseases by means of intravarietal and intervarietal crossing**).
Visn. Akad. Nauk Ukrajin. RSR (Rec. Ukrain. Acad. Sci.) 1957 : No. 2 : 39–46. [Ukrainian].

The resistance of Lutescens 17 and Ukrainka to *Puccinia*, *Ustilago* and *Tilletia* was improved and their yields raised by 5–21% by intravarietal open pollination or restricted open pollination with a few other varieties in the Ukraine. The 1000-grain weights of the experimental plants were as much as 15% higher than those of the initial varieties.

2772 Singh, H. G.
Mineral and protein content of wheat grain as influenced by variety, soil, and fertilizer.
Diss. Abstr. 1957 : **17** : Publ. No. 21,459 : p. 1441. (Abst.)

A study of Pawnee, Seneca, Butler and Cornell 595 indicated that genotype plays an important part in influencing ash composition of the grain, varietal differences being found in the contents of Zn, P, Ca, Mg, Na and other elements.

2773 Sikka, S. M. & Rao, M. V.
Inheritance studies in wheat II.
Indian J. Genet. 1957 : **17** : 7–18.

Good sources of resistance to *Puccinia graminis* var. *tritici* were found in the varieties NP790, Kenya 184 and P2AIF; Fronteira showed resistance to *P. triticina.* The above red-grained varieties were crossed with amber-grained varieties; in all the crosses red grain colour was dominant to amber. As regards dominant genes controlling grain colour, NP790 had one pair, Kenya 184 and P2AIF had two pairs and Fronteira had three pairs. Awning appeared to be controlled by duplicate genes in crosses between the awnless NP790 and fully awned types. The glume hairiness of C281, C591 and NP781 was monogenically dominant over the glabrous glume character of Kenya 184, P2AIF, Fronteira and NP790. Brown glume colour of NP790 was monogenically dominant over the white glume character of five other varieties.

2774 Kikuchi, M.
(**Studies on the transplantation of young embryos in cereals. III. On the flowering behaviour of young embryos in transplantation experiments involving wheat varieties differing in flowering behaviour**).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 66–75. [Japanese].

Eight Japanese varieties were used and young embryos were excised and transplanted into the endosperms of other varieties, without removing the embryos of the latter. In this way grains with two embryos were obtained and studies were made of the comparative heading behaviour of the resultant twin seedlings. No effect of the endosperm on the heading behaviour of the seedling from the transplanted embryo was observed.

2775 Vettel, F.
Stand der Qualitätszüchtung bei Weizen. (**The position of quality breeding in wheat**).
SB dtsch. Akad. LandwWiss. Berl. 1956 : **5** : No. 11 : Pp. 32.

The position reached in 1955 in the German Democratic Republic with regard to combining quality with high yielding capacity and other desirable characters in winter and summer wheats is reviewed. Tabular data are provided on the performance of some promising crosses. It is thought that better yields could be obtained by breeding varieties adapted to a high level of fertilizing and irrigation.

2776 HARRIS, R. H., SIBBITT, L. D. & SCOTT, G. M.
Quality evaluation in North Dakota wheat hybrids.
Cereal Sci. today 1958 : **3** : No. 1 : 6–9.

Some of the procedures used in evaluating the milling and baking quality of hard-red spring wheats at the Department of Cereal Technology of the North Dakota Agricultural Experiment Station are described. Data on the yield, wheat protein, flour yield, flour ash, flour absorption, specific flour volume and sedimentation value of eight varieties are tabulated and diagrams of farinograms and extensograms are also included.

2777 SIMS, H. J. & MULLALY, J. V.
Relationship between varieties and protein content of wheat grown in Victoria.
J. Dep. Agric. Vict. 1958 : **56** : 11–19.

Tabulated data on the grain nitrogen, grain protein and yield of a number of wheat varieties are presented and discussed. The major sources of variation in grain nitrogen values were found to result from environmental variation between trials but some smaller but significant intervarietal differences were also found within each trial. Differences between varieties in respect of protein percentage were small and it is concluded that it should be possible to breed high-yielding varieties without lowering the protein content of the grain.

2778 PISSAREV [PISAREV], V. E.
Selektion für höheren Proteingehalt im Sommerweizen. (**Selection for higher protein content in spring wheat**).
Züchter 1957 : **27** : 371–75.

After reviewing attempts made in various countries to produce a spring wheat giving a satisfactory yield of grain with high protein content under damp conditions, the author describes the breeding of spring wheat x spring rye amphidiploids in the USSR. These amphidiploids are superior to normal spring wheats in protein content and several other characters [cf. XXVI, 1139]; amphidiploid x spring wheat crosses showed marked differences in the effect that weather conditions had on the protein content of the grain. Some of these crosses were of good baking quality. A higher protein content was also found in grain from a cross between an amphidiploid, winter wheat x *Agropryon glaucum*, and the spring wheat Moskovka [wheat from Moscow].

2779 FINNEY, K. F. & FRYER, H. C.
Effect on loaf volume of high temperatures during the fruiting period of wheat.
Agron. J. 1958 : **50** : 28–34.

In an analysis of 513 samples representing 13 winter and 7 spring varieties of hard red wheat, loaf volume and mixing time of the dough decreased, in general, with increasing number of accumulated degrees above 90° F. during the last 15 days of the period of heading to ripening. This reduction was partly dependent upon variety. Protein content accounted for about 95% of the variation in loaf volume if temperature was not a limiting factor. Varieties with longer mixing times were more tolerant of the detrimental effects of high temperature than those with shorter mixing times.

2780 SANDHU, A. S. & LAUDE, H. H.
Tests of drouth and heat hardiness of winter wheat.
Agron. J. 1958 : **50** : 78–81.

Investigations briefly reported previously are described in detail [1536].

2781 FORCE, D. W.
Growth rates of winter wheat seedlings as affected by drought, temperature, and heritable selections.
Univ. Wyo. Publ. Sci. 1957 : **21** : p. 189. (Abst.)

"Ten selections of winter wheat were tested at five constant temperatures and three levels of moisture under laboratory conditions.
Growth rate responses of winter wheat for the main effects and the interactions were significantly different". [Author's summary].

2782 KOROBOČKIN, I. V., STRUCOVSKAJA, E. S. & ŠLIMOVIČ, B. M.
(**An apparatus for determining the mechanical properties of the culm**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 5 : 63–65. [Russian].

The mechanics of a portable apparatus which gives accurate readings in the field of firmness of straw at the lower internodes of such plants as wheat is described. It is said to be of value to plant breeding institutes and has been used at the Institute of Plant Industry to determine lodging resistance of some introduced winter wheats. Among the forms which obtained the highest rating for lodging resistance is a local Swedish wheat listed as 14187, the variety Neuzucht 14/14 [Newly-bred 14/14] and several

Triticale hybrids from the German Democratic Republic.

2783 Lupton, F. G. H. & Macer, R. C. F.
The breeding of disease-resistant winter wheats.
Agriculture, Lond. 1958 : **64** : 540–44.

Work at the Plant Breeding Institute, Cambridge, England, includes breeding for resistance to *Puccinia glumarum*, *Ustilago tritici*, *Erysiphe graminis* and *Cercosporella herpotrichoides*. In the case of the first three pathogens the problem is complicated by the presence of physiological races of the fungi and in the case of *E. graminis* resistance is being sought by interspecific hybridization using *Triticum timopheevi* and *T. carthlicum*. The ultimate aim is the development of a collection containing lines possessing all the known factors for resistance to the more important diseases while continuing the search for possible new sources of resistance.

2784 Takegami, S.
(The significance of the connexion between the mode of anther extrusion in wheat and infection by *Gibberella zeae*).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : 31–32. [Japanese].

It has been shown that infection of the spikelets tends to occur via the aborted anthers. Four categories of varieties are differentiated on the basis of mode of anther extrusion: A, varieties with short filaments in which the anthers fail to emerge past the tips of the glumes: B, varieties in which the anthers are trapped by the palea; C, varieties with long filaments in which the anthers are extruded beyond the glumes; and D, varieties in which retained and extruded anthers occur in comparable numbers.

2785 Gaskin, T. A., Caldwell, R. M., Compton, L. E. & Schafer, J. F.
Race 20 of *Ustilago tritici*.
Plant Dis. Reptr. 1957 : **41** : p. 975.

Race 20 attacks only Purdue 1 (CI11380) in Bever's set of differential varieties of wheat. The long period of serial passage through this one variety, since the race was first isolated in 1938, may have resulted in the selection of a culture with the ability to attack only Purdue 1. In early tests some of the other differentials were slightly susceptible to this race but in more recent tests they have not been infected. The only other wheat known to be susceptible is Gladden.

2786 Kačalova, Z. P.
(A description of wheat development under conditions of infection with *Tilletia tritici* Wint.).
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1957 : **6** : 18–42. [Russian].

Plants raised from grains germinated on infected soil showed improved vigour and most varieties showed a low degree of infection on being later transferred to the field. Even in such a susceptible variety as Caesium 111, diseased plants did not exceed 5%. As the beneficial effects of this treatment are said to persist in the succeeding generation it is thought that the method could be used for breeding forms with high yield and resistance to *Tilletia*.

2787 Kendrick, E. L. & Holton, C. S.
New physiologic races of *Tilletia caries* in the Pacific Northwest.
Plant Dis. Reptr. 1958 : **42** : 15–17.

Two new races of *T. caries*, T–17 and T–18, have been identified. T–18 attacks wheat varieties possessing both the Turkey and Martin types of resistance. The Ridit type of resistance is however effective against this new race. T–17 and the old race L–8 of *T. foetida* are identical in their host range; T–17 therefore presents no new problem in breeding. It may be preferable to L–8 as a tester for smut reaction since it has a less debilitating effect upon the infected plant.

2788 Mascarenhas, F. O. da F. & Silva, A. R. da
Pesquisa de fontes de resistência a *Tilletia foetida* (Wallr.) Liro. [**Search for sources of resistance to *T. foetida* (Wallr.) Liro**].
Bol. téc. Inst. agron. Sul 1956 : No. 14 : Pp. 13.

Thirty-two varieties of wheat were inoculated with cultures of the organism collected in four different localities in the state of Rio Grande do Sul in Brazil; none proved resistant to all cultures but Regent was less severely attacked than the rest, in tests both with the individual cultures and with mixed inoculations with all four. Klein Orgullo [Pride], and Charter were also above the average in resistance; Lageadinho, Pink and Trapeano were resistant to one culture only and DP134 to another; Combate, Petiblanco and Negroz were resistant to two and DP131/3 to three cultures out of the four. Many varieties previously considered resistant, such as Bagé, Trintecinco [Thirty-five], Patriarca [Patriarch] and Trintani, proved susceptible.

Informe de la Tercera Conferencia Internacional de la Roya del Trigo efectuada en la Oficina de Estudios Especiales de la Secretaría de Agricultura y Ganadería México, D.F., México, Marzo 18–24, 1956. (**Report of the Third International Conference on Wheat Rust, held in the Bureau of Special Studies of the Ministry of Agriculture and Livestock, Mexico, DF, Mexico, 18–24 March 1956**). Pp. 167. (Mimeographed).

2789 *Peterson, R. F. Resultados obtenidos en el mejoramiento de trigo con los métodos de pedigree y cruzas regresivas.* (*Results obtained in breeding wheat by the pedigree and back-cross methods*). (*pp. 6–11*).

A brief review is given of breeding for disease resistance in North America and Australia where the back-cross method is chiefly used, in South America, where the pedigree method has been widely employed but where the back-crossing technique has recently been widely applied, and other areas where the back-crossing method is less widely used.

2790 *Watson, I. A. Combinación de resistencias como un procedimiento genético de mejoramiento.* (*Combination of resistance as a genetical breeding procedure*). (*pp. 11–13*).

The history of the appearance of successive new races of *Puccinia graminis* var. *tritici* and *P. rubigo-vera* var. *tritici* in Australia and the development of new varieties carrying genes resistant to them is outlined. The gene *Kb*1, found in Kenya 117A, confers resistance to all four stem-rust races 126 Anz. 1, 126 Anz. 2, 222 Anz. 3 and 222 Anz. 4. A *Triticum timopheevi* derivative, CI12632, is resistant to the first three of these races; Eurga, carrying the genes *Ka*1 and *Kc*1, and Charter, carrying *Kc*1, are resistant to the first two. Eureka, carrying *Ka*1, is resistant to the first race. So far no new races have been found on varieties carrying *Kb*1.

In breeding for stem-rust resistance it has been found desirable to combine two or more genes for resistance, thus allowing greater possibilities of retaining resistance to new mutant races to which one of the genes may no longer confer resistance.

2791 *Borlaug, N. E. El desarrollo y uso de variedades compuestas, basado en la mezcla de líneas fenotípicamente similares desarrolladas a través de cruzas regresivas.* (*The development and use of composite varieties, based on mixing phenotypically similar lines developed through back crosses*). (*pp. 14–20*).

With the aim of combining several sources of rust resistance affording protection both against prevalent races and against possible new mutants, and at the same time retaining other desirable agronomic characters, synthetic varieties are being developed in Mexico. The commercial varieties Yaqui 50, Gabo and Kentana 48, carrying the Newthatch, *durum* and Kenya 324 types of resistance respectively, have been crossed with 50 other parents selected on the basis of their reaction in the International Rust Nurseries and the progeny are undergoing back crossing and selection to produce agronomically uniform and desirable types. The lines finally selected are to be used in producing synthetic varieties.

2792 *Konzak, C. F. El uso de las mutaciones inducidas en el mejoramiento del trigo para obtener resistencia a la roya.* (*The use of induced mutants in wheat breeding to obtain resistance to rust*). (*pp. 20–28*).

After a general survey of the advantages and disadvantages of breeding for disease resistance by induction of mutation by irradiation, examples of resistance to Mexican rusts induced in the wheat Lerma by X rays and thermal neutrons are given. Short-strawed mutants have been obtained in the same variety and resistance to *Puccinia glumarum* has been induced in Gabo. X-ray and thermal-neutron induced oat mutants of Tama resistant to Victoria blight are also mentioned.

2793 *Patterson, F. L., Schafter, J. F.,* Caldwell, R. M. & Compton, L. E. Resultados de diferentes métodos fitotécnicos en el mejoramiento de los cereales en la Universidad de Purdue.* (*Results of different breeding methods in cereal breeding at the University of Purdue*). (*pp. 29–32*).

Wheats with improved yields have been obtained by simple crosses involving limited germ plasm and complex crosses among several varieties, while resistance to diseases has been incorporated by means of back crossing. Similar methods have been used for barley and oats.

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* Presumably Schafer, J. F.

2794 *Vallega, J. Incorporación de factores de resistencia distribuídos en el complejo varietal cultivado, con el propósito de neutralizar las variaciones que se producen en las poblaciones parásitas.* (*The incorporation of resistance factors distributed throughout the assortment of cultivated varieties with the aim of neutralizing the variations occurring in populations of parasites*). (*pp. 32–35*).

Plans for introducing numerous resistance factors into all the best new varieties are outlined, the aim being to produce a wide enough range of material to allow the replacement of any variety which becomes susceptible to mutant races by a resistant variety. A list of the sources of resistance used is included.

2795 *Atkins, I. M., Weibel, D. E. & Futrell, M. C. Progreso logrado en los trabajos de mejoramiento para adicionar resistencia a las royas de la hoja y del tallo en trigos adaptados a las condiciones de Texas.* (*Progress achieved in work on breeding to increase leaf and stem rust resistance in wheats adapted to conditions in Texas*). (*pp. 35–37*).

Breeding for rust resistance in Texas is surveyed with special reference to material developed since 1950, when stem rust 15B became prevalent. The breeding material used includes Kenya Farmer, Egypt 95, Egypt 101, derivatives of *Agropyron* and some Mexican lines. Durum wheats for central Texas are being developed. The inheritance of resistance to 15B is being studied in derivatives of Kenya and Bowie, in crosses of hard commercial wheats with Kenya Farmer, in a cross of Khapli emmer and in derivatives of other species. Lines from (*Triticum dicoccum* x *Aegilops speltoides*) x Austin^2 have been crossed with several commercial varieties and appear to be promising as sources of rust resistance. Other promising material is a hybrid of a sister line of Bowie with a selection from Newthatch x Frontana.

2796 *Johnson, V. A. & Schmidt, J. W. El programa de cruzas para obtener resistencia a las royas en Nebraska.* (*The crossing programme for obtaining resistance to rusts in Nebraska*). (*pp. 37–39*).

Back-crossing techniques have been employed using Kenya wheats, Mida, Newthatch, McMurachy-Exchange x Redman, derivatives of *Triticum timopheevi* and Webster as sources of resistance. Selection is effected on the basis of reaction to stem rusts 11, 15B, 17, 29, 38, 48, 56 and 139. The winter wheat Cheyenne and various advanced derivatives of Hope x Cheyenne have proved highly resistant to races 29, 48A and 139. The reaction of F_4 and F_5 segregates of Cheyenne crossed with spring wheats indicated that one or two closely linked genes govern combined resistance to these races in Cheyenne.

2797 *Campbell, A. B. Programa de mejoramiento en el area de trigo con royas en Canadá.* (*Breeding programme in the wheat-rust area in Canada*). (*pp. 39–41*).

In the intensive back-crossing programme initiated in 1951, the characters being transferred to Thatcher, Lee, Redman and Selkirk include resistance to leaf rust, stem rust and loose smut. Some of the lines are now in the seventh generation of back crossing and some have been used as parents in further crosses. Chinook, resistant to sawfly, has been used as recurrent parent in crosses with Kenya Farmer and Frontana, respectively resistant to stem rust and leaf rust.

2798 *Masson, A. B. Mejoramiento de trigos durums en Canadá.* (*Breeding durum wheats in Canada*). (*pp. 41–42*).

The varieties RL3206 and RL3207, both poor in quality but carrying resistance to stem rust race 15B derived from Golden Ball and Iumillo, and a number of other rust-resistant varieties are being used in a back-crossing programme with short-strawed derivatives of Nugget, a wheat suitable for macaroni.

2799 *Cortázar, R. Mejoramiento de trigo candeal en Chile.* (*Breeding of durum wheat in Chile*). (*pp. 42–43*).

Material resistant to *Puccinia graminis* and superior in agronomic characters to Capelli* has been obtained from Capelli^3 x Giza.

2800 *Gibler, J. W., Rupert, J. A. & Peña A., L. Trigos compuestos en Colombia.* (*Composite wheats in Colombia*). (*pp. 43–44*).

The production of disease-resistant back-cross lines for use in the development of composite varieties in Colombia is outlined. Frocor 316, Menkemén 626, Bonza and Gabo are used as recurrent parents and 126 varieties of *Triticum vulgare* and 30 of *T. durum* are employed as sources of resistance to black rust and yellow rust.

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* The Italian variety Cappelli?

2801 *Gutiérrez Cruz, P. Estudios que se están realizando en México para obtener mayor resistencia a las diferentes razas de chahuixtle que atacan a la especie* Triticum vulgare, *mediante cruzamientos interespecíficos. (Studies which are being carried out in Mexico to obtain greater resistance to the different stem-rust races attacking the species* Triticum vulgare, *by means of interspecific crosses). (pp. 45–48).*

Breeding for resistance to *Puccinia graminis* var. *tritici* in Mexico is reviewed, mention being made of the chief sources of resistance used. Several lines developed during the early phases of the breeding programme have retained their resistance in spite of the development of new rust races. Line C145–2–1, developed from a cross of C2 with *Triticum dicoccum* 'Khapli', is a bearded, white-chaffed wheat with hard red grain, difficult to thresh because of the brittle rachis and the resistance of the grain to shedding; it is highly resistant to stem rust. The selection has undergone further crossing with C5 to produce C708.

2802 *Galárraga, J. R. Producción y mejoramiento de trigo en Ecuádor. (Wheat production and breeding in Ecuador). (pp. 49–52).*

A programme has been initiated in which local varieties are crossed with the most promising introductions from Colombia, Peru, Argentina, Mexico and the USA. Colombian varieties appear to be particulary promising.

Lists are provided showing the sources of resistance to *Puccinia glumarum* in use, varieties already undergoing multiplication and promising varieties which are being tested.

2803 *Cabera I., M. Problemas de la producción triguera en Bolivia. (Problems of wheat production in Bolivia). (pp. 52–53).*

Introductions from Mexico, Peru and Colombia have shown promise. Trials are conducted chiefly at La Tamborada Agricultural Experiment Station, Cochabamba, at an altitude of 2550 m. Belén Experimental Station on the margin of Lake Triticaca is particularly suitable for testing for resistance to stem rust and yellow rust.

2804 *Young, H. C. (Jun.) & Schlehuber, A. M. Genes y fuentes de resistencia a las royas del trigo. (Genes and sources of resistance to wheat rusts). (pp. 53–54).*

Among sources of resistance to leaf rust is the cross *Triticum* sp.-*Agropyron elongatum* x Pawnee CI13020, which is highly resistant in the seedling stage to races 5, 9, 15, 21, 32, 35, 58, 105, 105A, 105B and 126 and shows immunity in the field. In crosses of this line with other varieties, the F_1 progeny, when tested for reaction to 105B, showed intermediate seedling resistance and field immunity. The F_2 was highly variable and no definite ratio could be established; about half the plants showed some degree of resistance and the rest were completely susceptible. Resistance to the above races is also found in Aniversario CI12578; resistance to 105B appeared to be controlled by a simple recessive in some crosses and by two recessive factors in others. With the exception of race 35, a selection from Wabash x American Banner CI12757 has also proved resistant to all the above races; in a cross with Kenya Farmer CI12880 the resistant reaction to 105B was determined by a single dominant factor.

Lines from other crosses under investigation are noted.

2805 *Hayne, E. G. & Johnston, C. O. Fuentes de resistencia a la roya en trigos de invierno. (Sources of rust resistance in winter wheats). (p. 55).*

Lines with superior adult-plant resistance to stem rust have been selected from the three crosses, Frontana x Mediterranean-Hope-Pawnee, Centenario x Mediterranean-Hope-Pawnee and Ponca x McMurachy-Redman^3, and are being crossed with winter wheats in Kansas. They are also resistant to many leaf-rust races. Shands 473 x Cheyenne, a derivative of *Triticum timopheevi*, is being used in breeding. *Agropyron* x Cheyenne back crossed to Cheyenne has 20 bivalents and two univalents; the *Agropyron* chromosome appears to confer resistance to many leaf-rust races, moderate resistance to races 17, 38, 56 and 15B of stem rust and resistance to several races of covered smut. Other *Triticum* x *Agropyron* crosses in use include types with the whole wheat chromosome complement and some additional *Agropyron* chromosomes ($2n = 42$–44) and other forms with approximately $2n = 56$. Leaf-rust resistance may be transferred fairly easily from the latter type to wheat but the transfer of stem-rust resistance is more difficult.

2806 *Vallega, J. & Cenóz, H. P. Fuentes de resistencia a* Puccinia graminis tritici *y* P. rubigo-vera tritici *más importantes para Argentina. (The most important sources of resistance to* P. graminis tritici *and* P. rubigo-vera tritici *in Argentina). (pp. 56–57).*

Wheats resistant to the main biotypes of the above rusts isolated in Argentina and neighbouring countries are listed.

2807 *Gibler, J. W., Orjuela N., J. & París, R. Fuentes de resistencia a* Puccinia graminis tritici *Erickss & Henn y* Puccinia glumarum *(Schmidt) Erickss & Henn usadas en Colombia.* [*Sources of resistance to* P. graminis tritici *Erickss. & Henn. and* P. glumarum *(Schmidt) Erickss. & Henn. utilized in Colombia*]. (*pp. 58–60*).

The chief sources of resistance to yellow and black rusts available for breeding in Colombia are listed. At least two races of yellow rust occur as well as races 10, 15B, 38, 48 and its biotypes, 78 and 151 of black rust.

2808 *Zapata B., M., García, L. A. & Reyes N., R. Híbridos de trigo promisorios para Colombia.* (*Promising wheat hybrids for Colombia*). (*pp. 61–62*).

A list of promising hybrid lines undergoing trial and expected to replace Menkemén and Bonza is provided, together with information on their quality and resistance to yellow and black rust.

2809 *Ausemus, E. R., Sunderman, D. W. & Hsu, K. J. Otras fuentes de resistencia usadas en los programas fitotécnicos de Minnesota.* (*Other sources of resistance used in the Minnesota breeding programme*). (*p. 63*).

Selections with very good resistance to both leaf and stem rust have been obtained from Frontana x Thatcher, Frontana x Kenya 58-Newthatch and Frontana x Kenya 117A-Mida. The combination of quality with resistance is proving difficult. Material resistant to both rusts in the field and showing seedling resistance to stem rust race 15B has been selected from (Frontana x Thatcher 3) x (Kenya 58-Newthatch II–55–29 x Thatcher 2) and is being multiplied in California. Crosses of *Triticum orientale* x *Agropyron* with spring and winter wheats produce a completely sterile F_1 except where Selkirk is used as the wheat parent.

2810 *Unrau, J. Desarrollo de trigos de primavera blancos y blandos resistentes a las royas del tallo y de la hoja.* (*Development of soft white wheats resistant to leaf and stem rusts*). (*pp. 64*).

Kenya AC_2 E_3 and wheat x *Agropyron* crosses have been used in breeding for rust resistance. More than 200 lines are being tested for seedling and field reaction to stem rust $15B_3$ at various stations in Canada.

2811 *Acosta, A., Rodríguez, R. & García, M. Fuentes de resistencia a* Puccinia graminis tritici *que han sido usadas o están siendo usadas en el programa mexicano de mejoramiento.* (*Sources of resistance to* P. graminis tritici *which have been used or are being used in the Mexican breeding programme*). (*pp. 64–66*).

A list of the wheats used and their countries of origin is presented.

2812 *Bastos Lagos, M. Fuentes de resistencia a la roya del tallo empleadas en el programa de mejoramiento del trigo en Río Grande do Sul, Brasil.* (*Sources of stem-rust resistance employed in the wheat breeding programme in Río Grande do Sul, Brazil*). (*pp. 66–67*).

Varieties resistant to (*a*) races 11 and 17 and (*b*) races 11, 17 and 15B are listed.

2813 *Hayden, E. B. Diferencias en infectabilidad entre variedades de trigos de primavera.* (*Differences in susceptibility among spring wheat varieties*). (*pp. 67–68*).

In studies of varieties differing in susceptibility to stem-rust race 15B, the number of primary lesions produced after inoculation corresponded to the severity of infection under natural conditions, Lee and Rushmore showing the fewest lesions and Mida and Marquis the most.

2814 *Borlaug, N. E., Vallejo, J. R. & Curiel, F. Resistencia en estado adulto y tolerancia de ciertas variedades a la roya del tallo y las dificultades para valorizar apropiadamente este tipo de resistencia tan útil.* (*Resistance in the adult stage and tolerance of certain varieties to stem rust and the difficulties of evaluating this useful type of resistance appropriately*). (*pp. 68–69*).

Under greenhouse conditions, Kentana 54 (Kentana 48 x Río Negro) proved susceptible at the seedling stage and moderately susceptible at the adult stage to races 29, 48, 49 and 139 but when grown at high altitudes and low temperatures in areas where these races are prevalent suffered little reduction in yield although showing a moderately susceptible reaction.

Barrigón Yaqui, a local variety including *Triticum turgidum* in its parentage, although showing seedling susceptibility to all the common stem rusts of Mexico, is resistant in the adult stage under greenhouse conditions to all except 15B, to which it is moderately susceptible. In the field, the greater susceptibility found at low than at high temperatures may be related to the greater rapidity of lignification of the stem occurring at high temperatures.

2815 *Snyder, L. A., Burnham, C. R., Inman, L. L., Pi, C. P. & Turcotte, E. L. Investigaciones citogenéticas sobre trigo de la universidad de Minnesota. (Cytogenetic investigations on wheat at the University of Minnesota). (pp. 70–73).*

Monosomic substitution lines between Chinese Spring and the donor varieties Lee, Frontana, some Kenya wheats and other selections are being used in the study of inheritance of rust resistance. Two dominant factors controlling resistance to an isolate of stem rust 56 have been found in Frontana, one lying on chromosome VI. Later tests with other isolates indicated that only one gene was responsible for resistance. The resistance of Frontana to an isolate of 15B was recessive.

2816 *Knott, D. R. La herencia de la resistencia a las razes 15B y 56 de la roya del tallo en ciertas variedades de trigo común con referencia especial a las variedades de Kenya. (The inheritance of resistance to stem-rust races 15B and 56 in certain varieties of common wheat with special reference to the Kenya varieties). (pp. 73–75).*

Genotypes are given for 18 varieties, the following genes being involved. Sr_6 confers seedling resistance which is completely dominant for race 56 and dominant in some crosses for race 15B; resistance in adult plants is partially dominant. A partially dominant reaction to 15B of the type 1− to 1+ in the seedling and moderate resistance in the adult are conditioned by Sr_7. Sr_8 conditions a partially dominant reaction of the 2− to 2+ type to both races in the seedling, resistance to 15B in the adult plant being slight. Sr_9 governs the seedling reaction type 2− to 2+ to race 56 and is partially dominant. The reaction type 1− to 1+ in the seedling is conferred by the partially dominant gene Sr_{10}, which appears to act as a modifier of the resistance to 15B governed by Sr_7. Sr_{11} and Sr_{12} act as complementary dominants conditioning the reaction type 1+ to 2 to race 56 in the seedling and as complementary recessives conferring moderate resistance in the adult.

2817 *Sears, E. R. & Loegering, W. Q. Resistencia a la roya del tallo en cuatro variedades de trigo común. (Resistance to stem rust in four varieties of common wheat). (pp. 75–76).*

The reactions to various stem-rust races conditioned by chromosomes VIII and XVII of Hope, X of Timstein, III, XIII and XIX of Thatcher and VI, XIII and XX of Red Egyptian, as tested in substitution lines with Chinese, are listed. In addition, there may be a gene for resistance on Hope XV, and minor genes on Thatcher II and IX. Chinese carries resistance to race 111 of stem rust on chromosome XI and to race 9 of leaf rust on XIII and XIV.

2818 *Knott, D. R. Progreso en la transferencia de la resistencia a las royas de la hoja y del tallo de* Agropyron elongatum *(Host.) al trigo común. [Progress in the transfer of the resistance to leaf and stem rust of* A. elongatum *(Host.) to common wheat]. (pp. 77–78).*

F_{13} derivatives of (Chinese x *A. elongatum*) x Chinese showing resistance to races 15B and 56 and having $2n = 56$ were crossed and back crossed with Thatcher and the resistant plants finally selfed giving addition lines and substitution lines with 1_{II} of *Agropyron* and, respectively, 21_{II} and 20_{II} of wheat. Resistance to stem and leaf rusts was generally combined and in plants resistant to only one rust a telocentric chromosome was found, indicating that the two kinds of resistance lie on opposite arms.

After irradiation of the spikes of plants with 21_{II} of wheat and one *Agropyron* chromosome, a few resistant individuals lacking the *Agropyron* chromosome were obtained.

2819 *McGinnis, R. C. Estudios citogenéticos en trigo y en especies relacionadas a trigo. (Cytogenetical studies in wheat and in species related to wheat). (pp. 78–79).*

Plants resistant to stem-rust race $15B_3$, resembling Redman in appearance and earliness and carrying 42–45 somatic chromosomes, have been obtained by back crossing a wheat x *Agropyron elongatum* derivative ($2n = 56$) to Redman. With the aim of inducing translocation of the resistance-carrying portion of the *Agropyron* chromosome, plants from the early generations have been X irradiated; individuals with 41–43 chromosomes have been obtained. Derivatives of *A. tricophorum* x *Triticum durum* ($2n = 56$) and of *T. durum* x *A. obtusiusculum* ($2n = 70$) are resistant to rusts but show rather low fertility in crosses with Redman.

2820 *Sunderman, D. W., Ausemus, E. R. & Hsu, K. J. Herencia de la reacción a la roya del tallo en cruzas en las que interviene Frontana x Kenya 58 Newthatch como uno de los progenitores. (Inheritance of stem-rust reaction in crosses involving Frontana x Kenya 58 Newthatch as one of the parents). (pp. 79–82).*

Field resistance to race 15B in the F_1 and F_2

crosses of derivatives of Frontana x Kenya 58-Newthatch with Thatcher, Rushmore and Selkirk appeared to be conditioned by two independent factors showing partial dominance and subject to the influence of modifying factors. Highly resistant individuals were obtained by back crossing even to a susceptible parent. Data from the F_2 and F_3 of a cross of one of the derivatives with Rival also indicated control by two independent factors.

2821 *Unrau, J. Progresos y problemas fitotécnicos referentes a la resistencia a la roya y a otros caracteres usando el método de substitución total del cromosoma. (Breeding advances and problems concerning rust resistance and other characters using the method of total substitution of the chromosome). (pp. 83–84).*

In addition to the work reported earlier [XXVII, 399], it is noted that the genes for susceptibility to leaf rust in Thatcher are carried on chromosomes IX, X, XII and XXI, as shown by the behaviour of substitution lines of these and other Thatcher chromosomes in Chinese Spring.

2822 *Campbell, A. B. & Peterson, R. F. Herencia de la resistencia a la roya del tallo. (Inheritance of stem-rust resistance). (pp. 84–85).*

The results of crosses among Kenya 122, McMurachy, Gabo, RL2500 and Garnet indicate that the first two have one major gene for resistance to races 56 and 15B in common and that Gabo and RL2500 have at least one and possibly two common genes for resistance to race 46, inherited independently of the Kenya 122 gene.

2823 *Pugsley, A. T. Genética de la resistencia a la roya del tallo del trigo. (Genetics of resistance to wheat stem rust). (pp. 85–86).*

Crosses among a number of wheats indicated that 15 of the varieties tested, most of them Kenya wheats, carried a common gene for resistance to race 222 Anz. 2, designated *SrKa*1. These wheats also proved resistant to other races including 15B and were susceptible to 49.

2824 *Heermann, R. M., Smith, C. S., Briggle, L. W. & Schwinghamer, E. A. Herencia de la reacción a la roya del tallo en ciertos trigos durum y emmer. (Inheritance of stem-rust reaction in some durum and emmer wheats). (pp. 86–88).*

In the cross Mindum x Vernal emmer, a gene for resistance to race 17 in the latter is allelic or closely linked in repulsion with a gene for resistance to race 147 in the former. Two dominant genes for seedling resistance to 15B occur in Khapli emmer x Stewart; adult resistance involves at least four genes, two of which may be the same as those for seedling resistance. Similar, apparently allelic, single genes for seedling and adult resistance to 15B occur in CI3255, PI94701, RL1714 and PI168906. In St464 and PI192179, two 15B resistance genes are found, one of which may be allelic with one of the Khapli genes.
A list of the varieties studied, their reaction types to races 15B, 17 and 147 and the suggested symbols for the different genes is included.

2825 *Ausemus, E. R., Hsu, K. J. & Sunderman, D. W. Un estudio genético de las reacciones de ciertas variedades de trigo a la raza 15B de la roya del tallo. (A genetical study of the reactions of certain wheat varieties to race 15B of stem rust). (pp. 88–89).*

Crosses among the 15B-resistant varieties II–50–18, selected from Frontana x K58-Newthatch, and Kenya Farmer and the susceptible wheat Ceres, suggest that the first has the genotype *AABBSS*, the second *aabbss* and the third *aaBBSS*. *A* and *B* govern resistance; *S* determines susceptibility and is complementary to the resistance genes; and the complementary effect of *BS* is inhibited by *A*. Minn. II–50–17, another selection from Frontana x Newthatch, appears to carry the same factors as II–50–18.

2826 *Hsu, K. J. & Ausemus, R. R. Resistencia a la raza 15B de la roya del tallo lograda mediante radiación ionizada en el trigo. (Resistance to stem-rust race 15B obtained by means of ionizing radiation in wheat). (p. 90).*

Resistant plants occurred with frequencies of 0·1% in the X_2 and 0·4% in the N_2 progenies of material of the susceptible spring variety Lee irradiated with respectively X rays at 12,000–16,000 r. and thermal neutrons at $9{\cdot}94 \times 10^{12}/\text{cm}^2$. X_1 and N_1 lines of the winter wheat Minn. III–54–112 show differences in proportion of germinating seedlings and seedling height for different doses.

2827 *Robles G., L. & Martín C., A. Rendimiento y reacción a* Puccinia graminis tritici *de cinco variedades de trigo en Monterrey, N.L. (Yield and reaction to* P. graminis tritici *of five wheat varieties in Monterrey, NL). (pp. 91–93).*

Information is given on the yield and stem-rust reactions of some wheats in Nuevo León, Mexico.

2828 *Hart, H. Variabilidad en la resistencia de los trigos a la roya del tallo.* (*Variability in the resistance of wheats to stem rust*). (*pp. 94–95*).

Variation in liability to infection and in reaction type after infection is discussed in general terms and the need for developing varieties with a wide general resistance is stressed.

2829 *Pérez, R., Campos, A. & Borlaug, N. E. Una técnica que ha sido útil en la clasificación de plántulas y plantas adultas por su resistencia a la roya del tallo, bajo condiciones de campo.* (*A technique which has been useful in classifying seedlings and adult plants for resistance to stem rust under field conditions*). (*pp. 95–96*).

In view of the frequent disparity between seedling resistance and field resistance of the adult plant, the following method of testing progenies has been developed. Seeds of the plants to be tested are sown in individual pots and inoculated with the test race as soon as the first two leaves are sufficiently developed. The seedlings classed as resistant or susceptible are transplanted into the field in separate rows. With adequate fertilizer treatment and irrigation the plants become robust and may be reinoculated for testing adult resistance.

2830 *Johnston, C. O. Reacción de plántulas de variedades de trigo a diferentes razas fisiológicas de la roya de la hoja.* (*Seedling reaction of wheat varieties to different physiological races of leaf rust*). (*pp. 96–98*).

Information on the reaction of nine winter and 12 spring wheats to numerous races in Kansas is tabulated.

2831 *Brown, A. M. & Johnson, T. Pruebas de variedades a las razas fisiológicas de la roya de la hoja del trigo.* (*Tests of varieties against physiological races of wheat leaf rust*). (*pp. 98–99*).

The testing of varieties for resistance to cultures of physiological races in selection plots is briefly outlined. Mida-McMurachy-Exchange II–47–26 and the South American lines Frontana, Aniversario, Supremo, La Previsión, Colotana, María Escobar and Río Negro have shown satisfactory resistance to the races prevalent in Canada.

2832 *Schafer, J. F., Caldwell, R. M., Compton, L. E. & Patterson, F. L. Reacciones de resistencia superior a la roya de la hoja del trigo mediante combinaciones de resistencia.* (*Reaction of superior leaf-rust resistance of wheat by means of combined resistance*). (*pp. 99–100*).

In breeding for combined resistance to leaf-rust races, crosses have been effected between Aniversario CI12578, Exchange CI12635, Frontana CI124470 and La Previsión 25 CI12596, all of which varieties show resistance ranging from type 0 for some races to types 1, 2 and X for others. In five of the six possible combinations, F_4 and F_5 lines showing much greater resistance to the test races 76 and 89 than either parent have been obtained. Improved resistance to 76 was also found in the F_2 of the sixth hybrid, La Previsión x Frontana.

2833 *Heyne, E. G. & Johnston, C. O. Herencia de la reacción a la roya de la hoja entre las ocho variedades diferenciales de trigo.* (*Inheritance of leaf rust reaction among the eight differential wheat varieties*). (*pp. 101–03*).

In most cases there appeared to be one gene for resistance to race 9 in each of the wheats studied, resistance being partially dominant. Mediterranean, Democrat and Pawnee probably carry the same gene for reaction to race 9. The results of the cross Red Chief x Pawnee show that the same factor governs resistance to races 9, 10, 11, 13, 19, 20, 31 and 93 and monosomic analysis indicates that it lies on chromosome X. Mediterranean and Brevit probably bear different alleles for reaction to race 9. Hussar appears to have a different, nonallelic gene from that of Mediterranean. Brevit and Carina seem to carry different alleles for resistance to race 9 while Loros and Webster are susceptible. Allelic genes controlling resistance to race 5 probably occur in Brevit, Carina, Webster and Loros, the resistance of Webster showing complete dominance in Mediterranean x Webster. In some crosses Hussar seemed to have one, in other crosses two, genes for resistance to this race. Malakof showed a similar variation with respect to race 15. Resistance to race 126 is governed by alleles in Brevit and Carina and by two further factors, which may be linked together, in Webster.

2834 *Caldwell, R. M., Schafer, J. F., Compton, L. E. & Patterson, F. L. Resistencia a la roya de la hoja derivada de* Agropyron elongatum. (*Leaf-rust resistance derived from* A. elongatum). (*pp. 103–04*).

Data on the segregation ratios for immunity to races 5, 76, 89 and 104B obtained in back crosses of the immune line Purdue 39120 A5–3–1–1–1 to Knox have been obtained but could not be interpreted. Purdue 39120 A5–3–1–1–1 [Trumbull x *A. elongatum*) F_1 x (Filtz x Trumbull-Hope-Hussar) F_1] resembles common wheat in appearance and its dominant immunity to 15 leaf-rust races has been transferred to Knox in the course of five back crosses.

2835 *Stakman, E. C., Stewart, D. M. & Hayden, E. B. El problema de la clasificación de los biotipos de* Puccinia graminis *var.* tritici *y otras royas de los cereales.* (*The problem of the classification of biotypes of* P. graminis *var.* tritici *and other cereal rusts*). (*pp. 106–08*).

The following varieties have proved most useful as differentials: for biotypes of races of the group 11–32, *Triticum vulgare* 'N. Dak. 3' and *T. durum* 'Ramsey' and 'RL3706'; for group 17–29, *T. vulgare* 'Magnif MG' and *T. durum* 'Ramsey', 'CI3255', 'RL3206' and 'Tremez Molle' [Soft Tremez]; for 15B, *T. vulgare* 'K117A' and 'Magnif MC' and *T. durum* 'Yuma' and 'RL3706'; and for 48A, *T. vulgare* 'Magnif G' and 'Magnif MG'. Factors causing difficulties in further classification include the continual development of new biotypes and the need for controlling temperature and other environmental factors in identifying biotypes, since the latter show appreciable environmental variation in effect.

2836 *Stewart, D. M., Stakman, E. C. & Cotter, R. U. Las razas de la roya del tallo en el trigo en los Estados Unidos y en México durante 1955.* (*The stem rust races on wheat in the United States and Mexico in 1955*). (*pp. 108–09*).

Among 755 isolates from the USA, 28 races and biotypes were identified, the most prevalent being race 15B (47%), group 17–29 (20%), race 56 (18%) and race 48A (5%). In Mexico, group 17–29 was most prevalent, with 63% of the 191 isolates, followed by races 15B (18%) and 48A (17%).

2837 *Green, G. J. & Johnson, T. Razas de la roya del tallo del trigo en Canadá en* 1953, *1954 y 1955.* (*Stem rust races on wheat in Canada in 1953, 1954 and 1955*). (*pp. 109–10*).

The most prevalent race was 15B (three biotypes), decreasing from 82% of the isolates in 1953 to 66% in 1955, followed by race 56 (two biotypes) with 14% in 1955. Two or more biotypes were found for races 29, 48, 11, and 87. Fourteen other races were identified.

2838 *Basile, R. Razas fisiológicas de* Puccinia graminis tritici *de Grecia.* (*Physiological races of* P. graminis tritici *from Greece*). (*pp. 110–11*).

A new race (N) from Greece has been identified by its reaction on 12 differentials. Other races found in Greece are: 14, 21, 34, 40, 75 and 16.

2839 *Sosa, O. N., Fumigalli, A. & LeBeau, F. J. Razas fisiológicas de* Puccinia graminis tritici *en Guatemala.* (*Physiological races of* P. graminis tritici *in Guatemala*). (*pp. 111–13*).

Differences in the susceptibility of varieties at varying altitudes appear to result from temperature differences and not from differences in the racial composition of the rust populations. The prevalent races are noted.

2840 *Postigo, R., García Rada, G. & Rondón, M. Razas fisiológicas de* Puccinia graminis tritici *en Perú.* (*Physiological races of* P. graminis tritici *in Peru*). (*p. 113*).

Races 15B, 189, 19, 14, 178 and 17 together accounted for 75% of the collections made in 1953; in addition, seven known races and 23 previously undescribed races were found.

2841 *Bastos Lagos, M. & Schiehll, J. Razas fisiológicas de* Puccinia graminis tritici *y* Puccinia rubigo-vera tritici *en el Estado de Río Grande do Sul, Brasil.* (*Physiological races of* P. graminis tritici *and* P. rubigo-vera tritici *in the state of Rio Grande do Sul, Brazil*). (*pp. 113–16*).

Details are given of the frequencies of stem-rust races 11, 15B and 17 and of 11 leaf-rust races in 1952–55. Four biotypes of stem rust 17 were distinguished.

2842 *Vallega, J. & Cenóz, H. P. Características patógenas de la raza 15B de* Puccinia graminis tritici *de Ecuador.* (*Pathogenic characteristics of race 15B of* P. graminis tritici *from Ecuador*). (*pp. 117–18*).

A biotype of which 20 samples were collected in Ecuador in 1955 is pathogenic on Mentana and its derivatives and Magnif MG which has hitherto proved resistant to races isolated in South America. The biotype appears to correspond to the Peruvian form 15B–4P. [cf. 2843].

2843 *Rojas M., E. Algunos aspectos de la raza 15B de* Puccinia graminis tritici *en el Perú.* (*Some aspects of race 15B of* P. graminis tritici *in Peru*). (*pp. 118–19*).
Four biotypes of 15B distinguished by their reaction on Mentana, Var. 11 and Khapli have been identified and designated 15B–1P, 15B–2P, 15B–3P and 15B–4P. Selections with both seedling and adult resistance have been found at La Molina. Among selections resistant to 15B and other races is Helvia [cf. XXVII, 2832].

2844 *Dickson, J. G. Informe de los progresos en el análisis genético de la patogenicidad en algunos patógenos de la roya.* (*Information on progress in the genetical analysis of pathogenicity in some rust pathogens*). (*pp. 119–20*).
Studies of clonal uredial lines of *Puccinia graminis* var. *tritici* races 56, 15B and 49 on four wheat varieties showed uniformity of reaction in the first race and variation in the other two. Clonal lines of races 1, 2 and 3 of oat stem rust showed greater uniformity when selfed on the secondary host than those of wheat stem rust. In studies of clonal lines of *P. sorghi* on nine selfed maize varieties of which eight carried single pairs of dominant genes conditioning differential resistance and one was a homozygote susceptible to all three races, it was found that, after selfing the rust lines on the ecidial host, one was avirulent on the eight resistant maizes and virulent on the susceptible variety, two were virulent against one of the differential genes and three were virulent against two.

2845 *Green, G. J. & Johnson, T. Pruebas de la reacción de las variedades de trigo a las razas de la roya del tallo.* (*Tests of the reaction of wheat varieties to stem-rust races*). (*pp. 121–22*).
After examples of the effect of temperature upon varietal reaction to individual rust races, it is noted that biotypes of race 29 occur which produce a moderately severe infection on K117A, K321, BT1B1 and K360H. No race or biotype virulent on Kenya Farmer or Mayo 54 has been found. The Canadian variety DT136 and the American varieties Ramsey and Towner are susceptible to the race of 15B attacking Golden Ball. DT136 is also susceptible to a biotype of race 11 and to some biotypes of races 29 and 48; DT137 is variable and includes some plants susceptible to these races. Resistance to all races tested has been shown by the American variety Yuma. The biotype which attacks Selkirk also attacks Langdon.

2846 *Johnson, C. O. Cambios en la prevalencia y distribución de las razas fisiológicas de* Puccinia rubigo-vera tritici *en los Estados Unidos.* (*Changes in prevalence and distribution of physiological races of* P. rubigo-vera tritici *in the United States*). (*pp. 122–23*).
Recent changes in rust populations related to changes in the varieties grown are noted.

2847 *Johnson, T., Brown, A. M. & Green, G. J. Las razas fisiológicas de la roya de la hoja del trigo en el Canadá en 1953, 1954 y 1955.* (*The physiological races of leaf rust of wheat in Canada in 1953, 1954 and 1955*). (*p. 123*).
Information on the distribution and prevalence of different races is presented. Races 1, 5, 15 and 126 contained biotypes differing in pathogenicity on derivatives of Hope and H44. Races 11, 15 and 126 are believed to include varieties distinct in their reactions on Lee.

2848 *Sibilia, C. Patogenicidad de* Puccinia rubigo-vera agropyri *en los cereales.* (*Pathogenicity of* P. rubigo-vera agropyri *on cereals*). (*pp. 123–24*).
The above rust produces a reaction of type 4 when inoculated on to Mentana. Barley seedlings are less susceptible, rye shows a hypersensitive reaction and oats remain free from infection.

2849 *Bulger, R. O. Erradicación del agracejo en los Estados Unidos.* (*The eradication of barberry from the United States*). (*pp. 126–27*).
Evidence of the greater range of variation in rust populations in regions where *Berberis* is common than in those where it is absent is included.

2850 *Futrell, M. C. & Pilgrim, A. J. Habilidad relativa de cuatro razas de* Puccinia graminis tritici *para invernar en Texas.* (*Relative abilities of four races of P.* graminis tritici *to overwinter in Texas*). (*p. 128–29*).
North of Waco, races 15B, 17, 38 and 56 failed to survive the winter when inoculated on to four wheat varieties, while south of Waco all overwintered, 15B on Nugget being the most aggressive. The rusts overwintered less well on wheats of decumbent habit than on erect varieties.

2851 *Sosa, O. N., Fumigalli, A. & LeBeau, F. J. Reacción de las variedades de trigo a las royas bajo diferentes condiciones ambientales en Guatemala. (Reaction of wheat varieties to rusts under different environmental conditions in Guatemala). (pp. 129–31).*

Differences in reaction of 12 varieties to *Puccinia graminis* var. *tritici*, *P. triticina* and *P. glumarum* at different altitudes are recorded.

2852 *Rodríguez Vallejo, J., Castilla Chacón, F. & Salazar T., J. Las areas trigueras de México y sus problemas con respecto a las royas. (The wheat-growing areas of Mexico and their problems with respect to rusts). (pp. 136–39).*

Lists of varieties for various regions resistant to races of *Puccinia graminis* var. *tritici* are included.

2853 *Shaw, M. & Samborski, D. J. Investigaciones sobre la fisiología de las relaciones huésped-parásito de los hongos de la roya y del mildiu. (Investigations on the physiology of the host-parasite relations of rust and mildew fungi). (pp. 140–41).*

In comparisons of inoculated material of the susceptible variety Little Club with that of the resistant wheat Khapli, Little Club showed a marked increase in dry weight and a slight decrease in total N, while in Khapli there was no increase in dry weight but a marked diminution in total N, the latter apparently resulting from the more rapid reduction of proteins to aminoacids. Little Club showed greater accumulation of C^{14}, P^{32} and Ca^{45} than Khapli, and this accumulation could be inhibited by respiratory inhibitors and anaerobiosis. Increase in respiration was greater in Khapli than in Little Club, and decomposition of indoleacetic acid by infected Khapli was more rapid and by infected Little Club slower than by healthy tissues.

2854 *Forsyth, P. R. Estudios sobre la naturaleza de la resistencia de los cereales a la roya. (Studies on the nature of the the resistance of cereals to rust). (pp. 141–43).*

The following observations are reported. (1) A substance which appears to be trimethylethylene is emitted by germinating uredospores of *Puccinia graminis* var. *tritici* and is thought to increase susceptibility of the host plant by increasing cell permeability. (2) An increase in susceptibility in Khapli wheat caused by treatment with DDT was associated with an accumulation of simple sugars and free aminoacids in the leaf. (3) In experiments on seedling inoculation of McMurachy with race 15B, a single 16-hour period of light at 60° F. produced resistance if the period occurred between 51 and 115 hours after inoculation, being most effective between 75 and 91 hours.

2855 *Hart, H. & Swaebly, M. A. Extractos de la roya que son tóxicos al trigo. (Rust extracts which are toxic to wheat). (p. 143).*

Extracts of germinated uredospores of *Puccinia graminis* var. *tritici* induced symptoms of rust infection when introduced into wheat leaves, the extracts from races 15B, 11 and 56 proving more toxic to a Kentana selection than to Little Club. The toxic substance was labile at 100° F. but was more active at 90° F. than at 65° F.

2856 *Futrell, N. S. Contenido de aminoácidos de las uredosporas de cinco razas de la roya de tallo del trigo. (Aminoacid content of the uredospores of five races of wheat stem rust). (p. 144).*

Uredospores of races 15B, 17, 29, 38 and 56 were analysed for content of isoleucine, leucine, lysine, methionine, phenylalanine, threonine and valine. The greatest differences among races were found in methionine and the least in phenylalanine. Race 15B was lowest in content of six of the aminoacids studied. It is suggested that further studies along these lines may throw light on the genetics of pathogenicity and host specificity.

2857 *Watson, I. A. Origen de la variedad Timstein. (Origin of the variety Timstein). (pp. 147–48).*

[Cf. XXVII, 1637].

2858 *Reaga S., H., Zapata B., M. & Valbuena, L. A. Calidad de las variedades e híbridos de trigo de Colombia. (Quality of wheat varieties and hybrids in Colombia). (pp. 150–51).*

Data on hectolitre weight, hardness, protein content and other grain characters are given for a number of standard varieties and 45 experimental lines which have yielded well in trials. Twelve have shown particularly good breadmaking quality.

2859 *Ortega C., J., Borlaug, N. E., Garza F., E. & Espino, S. Estudio sobre la mancha café del trigo. (Study of coffee spot in wheat). (pp. 157–60).*

In Mexico, varietal differences have been noted in susceptibility to coffee spot, a disorder of unknown origin characterized by the discoloration and premature death of patches of tissue on the exposed parts of the internodes and sometimes also on the rachis and glumes. It is often associated with the Hope type of stem-rust resistance and is most prevalent during the dry season.

2860 *Sierra F., J. A., Rico M., E. & Rupert, J. Programa de mejoramiento de cebada. (Programme of barley breeding). (pp. 160–62).*

Work already referred to [XXVI, 3309] is outlined and a table showing the earliness, yield, quality and reaction to lodging and diseases of 16 promising hybrids is presented.

2861 *Sierra F., J. A. & Arango A., R. Fuentes de resistencia a las principales enfermedades de la cebada en Colombia. (Sources of resistance to the principal diseases of barley in Colombia). (pp. 163–66).*

Lists are given of lines selected at the Tibaitatá and Bonza Experimental Stations, Colombia, for combined field resistance to (1) *Helminthosporium* spp., *Rhyncosporium secalis* and *Puccinia anomala*, (2) *Helminthosporium* spp. and *Rh. secalis*, (3) *Helminthosporium* spp. and *P. anomala*, (4) *Rh. secalis* and *P. anomala*, (5) *Erysiphe graminis*, (6) *Ustilago nuda* and (7) *P. graminis*. Additional resistance to loose and covered smut and mildew occurs in some lines.

2862 FUTRELL, M. C.
Wheat stripe rust epiphytotic in Texas in 1957.
Plant Dis. Reptr. 1957 : **41** : 955–57.

Data are included on the reaction of varieties and selections of hard red winter wheat to *Puccinia glumarum* in 1957 at Bushland, Tex. Kharkof, Cheyenne, Harveyland, Red Chief and the Texas selections 255–48–9, 256–50–3, 247–52–A182, 275–51–A46, CI13022, CI13023 and CI13024 displayed resistance. All these varieties were derived from Turkey wheat by direct selection or hybridization.

2863 BASILE, R.
Identificazione di razze fisiologiche di *Puccinia graminis tritici* Erikks. et Henn. provenienti dall'Algeria e dalla Grecia. **(Identification of physiological races of *P. graminis tritici* Erikks. et Henn. originating from Algeria and Greece).**
Boll. Staz. Pat. veg. Roma 1956 : **14** : 179–81.

The new races of this pathogen reported from Algeria [XXV, 102] and Greece [XXVII, 436] are now established as not having been found previously and are designated R9 and R8 respectively.

2864 **New wheats.**
Indian Fmg. 1957 : **7** : No. 8 : p. 3.

Attention is drawn to the superiority of the rust-resistant wheats NP710, 797, 798 and 799 over local varieties in India.

2865 BASILE, R.
Razze fisiologiche di *Puccinia graminis tritici* Erikks. et Henn. isolate da ecidioconidi di *Berberis vulgaris* raccolto durante l'estate 1956, in zone alpine. **(Physiological races of *P. graminis tritici* Erikks. et Henn. isolated from ecidiospores on *B. vulgaris* collected during the summer of 1956 in alpine zones).**
Boll. Staz. Pat. veg. Roma 1956 : **14** : 183–88.

Collections made in the regions of Piemonte, Trentino-Alto Adige and Venezia Euganea have yielded a total of seven races, of which two, 21 and 75, are common in Italy, two others, 207 and R19, have previously only been isolated from uredial collections, one, 194, is new to Europe and the remaining two, R48 and R49, are new to the world.

2866 VASUDEVA, R. S., LELE, V. C. & MISRA, D. P.
A new physiologic race of brown rust on wheat in India.
Indian Phytopath. 1957 : **10** : p. 157.

In a collection of samples of *Puccinia triticina* from the winter wheat crop in the Punjab in 1952–3, races 10, 20, 107 and a previously unidentified race were found. Several stocks of Agra local wheat were susceptible to the new race, which appears to be similar to race 70.

2867 VASUDEVA, R. S., LELE, V. C. & RAO, M. H.
A new physiologic race of *Puccinia graminis tritici* (Pers.) Erikss. and Henn. in India.
Indian Phytopath. 1957 : **10** : p. 158.

The new race reported here from the Lahaul Valley, Punjab, differs from race 21 by its pathogenicity to Einkorn. It resembles race 17 in the International Register of Black Rust Races.

2868 THORPE, H. C. & DIXON, C. E.
Review of rusts to attack wheat.
E. Afr. Fmr. & Planter 1957 : **1** : No. 4 : 52–53, 56.

The problems of rust attack and of breeding for resistance in Kenya are outlined. In view of the occurrence of highly virulent new races of stem rust in recent years, particularly at low altitudes, new sources of resistance and ways of lessening the time taken in breeding must be sought. An attempt to induce rust-resistant mutants of Kenya wheat by irradiation is already under way, seed having been sent to the USA for treatment.

2869 Loegering, W. Q. & Geis, J. R.
Independence in the action of three genes conditioning stem rust resistance in red Egyptian wheat.
Phytopathology 1957 : **47** : 740–41.

The wheat varieties Red Egyptian and Chinese and three substitution lines of Chinese containing a chromosome from Red Egyptian, involving chromosomes VI, XIII and XX, were inoculated with one of three races of *Puccinia graminis* f. sp. *tritici* and grown under one of five different controlled environments. It is concluded from the results, which are tabulated, that the reaction of Red Egyptian is controlled by one of three genes depending on which race is causing the infection. Thus resistance to culture 17–53B (race 29) is determined by *Sr* 9, to culture 56–51A (race 56) by *Sr* 9 at high temperatures and *Sr* 6 at low temperatures and to culture 15B–51A (race 15B) by *Sr* 6 at low temperatures and by *Sr* 8 at high temperatures.

2870 Eschena, T.
Costituzione della sostanza proteica del frumento e resistenza alle ruggini. (**Constitution of the protein substances of wheat and resistance to rusts**).
Ann. Fac. Agr. Perugia 1956 : **12** : 214–22.

Differences in the proportions of dicarboxylic and basic aminoacids in the protein hydrolysate of the grain have been found between wheat varieties susceptible and resistant to race 21 of *Puccinia graminis* var. *tritici*. In resistant varieties the ratio $\frac{\text{dicarboxylic}}{\text{basic}}$ aminoacids was approximately 1·0 but in susceptible varieties the ratios were 0·5, when measured as the fraction insoluble in alcohol at 70°, 0·7 when measured as the total aminoacid content and 1·5 to 2·5 when measured as the fraction soluble in alcohol at 70°. Moderately susceptible varieties showed intermediate values.

2871 Bullman, O. & Faber, W.
Studien zum Getreidewanzenproblem. (**Studies on the cereal-bug problem**).
PflSchBer. 1958 : **20** : Pp. 160.

A study of 32 wheats in North Austria revealed varietal differences in respect of damage to the grain caused by insects such as *Eurygaster* spp. and *Aelia* spp.; no relation was found between the time of ripening of the grain and the amount of insect damage.

2872 Goodey, J. B. & Hooper, D. J.
Observations on the effects of *Ditylenchus dipsaci* and *Anguina tritici* on certain wheat and barley varieties.
Nematologica, Leiden 1958 : **3** : 24–29.

Experiments carried out at Rothamsted, England, indicate that *D. dipsaci* from oats does not attack wheat in Britain, thus suggesting that the race of stem eelworm known to attack wheat in Italy is biologically different from that occurring in Britain. The Italian wheat varieties Funo, R37 and S1, known to be resistant to *D. dipsaci*, were susceptible to *A. tritici*, as were all other varieties tested, indicating that resistance to the one pathogen does not imply resistance to the second.

2873 Sandhu, R. S.
Mutagenic effects of 2,4-D in barley and wheat.
Diss. Abstr. 1957 : **17** : Publ. No. 21, 258 : p. 1450. (Abst.)

In experiments on the wheat Lee and barley Kindred, treatment with 2,4-D at the tillering or preboot stage in the greenhouse or field caused no significant increase over the controls in the number of off-type plants in the first and second generations, except in one case. This exception was shown by the first generation of field-treatment wheat, a significantly higher number of off-types resulting from treatment with 2,4-D amine at each of the above-mentioned stages and from treatment with 2,4-D ester at the preboot stage. The frequency of meiotic irregularities in plants of wheat or barley treated at the two stages of growth and in their progenies showed no significant increase.

2874 Fabergé, A. C.
A method for treating wheat pollen with ultraviolet radiation for genetic experiments.
Genetics 1957 : **42** : 618–22.

The apparatus and method are described as follows "The apparatus consists essentially of a vertical fused quartz tube 60 cm. long, 14 mm. internal diameter and 1 mm. walls. This tube is surrounded by three 'germicidal' mercury vapour tubes (WL782 H–10) whose power consumption is about 11 watts each, and whose active radiation is chiefly at wave length 2537 Å . . . A prepared wheat spike with bare receptive stigmas is inserted into the bottom of the quartz tube, where ultraviolet radiation is negligible, and a dehiscing anther is tapped at the top. Pollen falls down the tube by gravity and is thus irradiated before reaching the stigmas". The construction of a bolometer used for estimating the dose delivered is also described.

BUCKWHEAT

2875 Pisarev, V. E., Kuperman, F. M. & Mar'jahina, I. Ja.
(Biological control of development and growth in buckwheat).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1957 : No. 12 : 44–46. [Russian].

This article dealing with ontogeny notes some varietal differences in the early stages of development and mentions new Soviet tetraploid varieties which have reached the trial stage. They have large grain, rich in protein, and are superior to the diploid varieties in resistance to lodging and *Botrytis*. Crosses between diploid and tetraploid forms have been attained by combined use of vegetative and sexual hybridization. It is hoped that they have derived earliness from their diploid parent and other desirable characters from the tetraploid parent.

2876 Sal'nikov, V. R.
(The appearance of tetraploid forms in interspecific grafts of buckwheat).
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1957 : No. 8 : 82–88. [Russian].

Young plants of diploid buckwheat grafted on to the tetraploid Krupnozernaja II [Large-grained II] bore larger flowers and seeds than the ungrafted diploids. The progeny of the grafted plants contained a number of individuals showing morphological changes and some of them proved to be tetraploid; these plants were mostly slower in growth in the early phases but were taller at maturity; they had larger cells and stomata but lower seed yields in the first generation. Some lines became more fertile in later generations; thus the number of grains per plant varied from 19 to 43 in the F_1 and from 55 to 78 in the F_2; by selection it was possible to raise it to 182 in the F_3 and the best selections yielded 37% more grains than the initial diploids.

The proportion of polyploids in the progeny was increased by removing the leaves of the scion so as to intensify the influence of the rootstock. Some of the resulting plants were mixed in character and bore small grains, which gave rise to diploid progeny with $2n = 16$, as well as large grains which gave rise to tetraploids. Tetraploid plants similar to the above appeared when the same diploid varieties were grafted on to tetraploids of *Fagopyrum tataricum* and their origin is ascribed to the changed physico-chemical condition of the protoplasm, combined with sterility, resulting from the grafting.

OATS

2877 Abrams, R. & Frey, K. J.
The relationship between moisture content and X-ray sensitivity of oat seeds, *Avena sativa.*
Proc. Iowa Acad. Sci. 1957 : **64** : 155–59.

In studies of the effects of X rays upon germination, seedling height and seedling weight the moisture contents of the treated grains were, in order of decreasing sensitivity to X-ray doses of 15,000–40,000 r., 5·0, 18·2 and 13·8%. Grains with a moisture content of 18·2% were the most sensitive to increase in dosage.

2878 **Oat variety trials in north east Scotland, 1952-1955.**
Bull. N. Scot. Coll. Agric. 1957 : No. 1 : Pp. 15.

This bulletin forms the final report on trials, carried out in Aberdeenshire, including seven varieties in one series and six in a second, with Sun II as control in both cases. Data on early growth, maturity, lodging, grain yields and kernel yields are presented and discussed and recommendations made for the use of 11 of the varieties tested.

2879 Eikeland, H. J.
Havresorten Pendek. **(The oat variety Pendek).**
Bondevennen 1958 : **61** : 146–47.

Data on the maturity period, lodging, yield of straw and grain and moisture percentage, hectolitre weight, 1000-grain weight and husk percentage of the grain are given for 16 varieties tested at Forus, Norway, in 1957. Pendek, which has been recommended for south-eastern regions, did not do well.

2880 Andersen, T.
Forsøg med havresorter 1935–1954. **(Trials of oat varieties, 1935-1954).**
Tidsskr. Planteavl 1957 : **61** : 667–84.

Brief data on the results of trials of 25 varieties, held during 1935–48, and more detailed information on the yield, straw characters and earliness of nine varieties tested in 1949–54 are presented; both series of trials were held on a variety of soil types in Denmark. In addition, data on the performance of 16 varieties in preliminary trials are provided.

2881 Wild, A. S. & Reeves, J. T.
Oat trials and usage in the wheatbelt, 1956.
J. Agric. W. Aust. 1957 : **6** : 551–63.

Tables are included showing the acreage occupied by each of eight varieties between 1953 and 1956, the yields of nine varieties at six localities in Western Australia in the 1956–7 season, the hay yields of five varieties at three localities and the dry matter contents and grain yields from grazing trials of four varieties.

2882 **Hadmerslebener Auswuchsfester Gelb-Hafer.**
Dtsch. Landw., Berl. 1958 : **9** : p. 45.

Released in 1957, this variety, developed from a cross between Streckenthiner 9 and Kirsches Gelbhafer [Kirsch's Yellow oats] outyields both parents. It is resistant to lodging and shedding and grows well on all good to average soils; it is not suitable for mountainous districts because of its late ripening.

2883 **(The oat Sahalin I).**
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 1 : p. 35. [Russian].

This new productive variety from the Sahalin Agricultural Station shows above-average resistance to lodging, has a growth period of 100–120 days and is suitable for combine harvesting. In recent trials it outyielded the standard Pobeda [Victory] by 2·7–3·7 c. per ha.

2884 Poehlman, J. M.
O–205 oats. An improved "Columbia type" variety for Missouri.
Bull. Mo. agric. Exp. Sta. 1955 : No. 637 : Pp. 8.

This new variety, selected from Columbia x (Victoria x Richland, selection CI3311), resembles its Columbia parent in appearance but is slightly earlier and possesses superior lodging resistance. It is resistant to crown and stem rust, smut and Victoria blight and was developed at the Agricultural Experiment Station of the University of Missouri.

2885 Sims, H. J.
Oat varieties.
J. Dep. Agric. Vict. 1958 : **56** : 69–78.

Information is provided on varieties which (1) are recommended, (2) have been or are being replaced by the recommended ones and (3) are under test.

2886 Ramage, R. T. & Suneson, C. A.
A nullisomic oat.
Agron. J. 1958 : **50** : p. 52.

A nullisomic of *Avena byzantina* which has been used for chromosome substitution in breeding at the University of California, Davis, is briefly described. Compared with the normal form, it shows a reduction of 45% in height, 50% in tillering and 65% in number of florets per panicle. It may be maintained without cytological examination, since it is distinguishable by floral proliferations, delayed flowering and general stunting. Selfing results in a 10% seed set. With hand pollination without emasculation, seeds have been produced in one-fourth of the florets. The missing chromosome pair is neither one of the three satellited pairs nor the short pair with an almost terminal centromere.

2887 Nishiyama, I. & Inamori, Y.
(Longevity of oat grains in relation to polyploidy).
Kyoto Dagaku Shokuryo Kagaku Kenkyusho Hokoku/Bull. Res. Inst. Fd. Sci. Kyoto Univ. 1957 : No. 20 : 36–42. [Japanese].

Fifty grains of eleven species were stored in bags in an unheated room. The diploid and tetraploid species retained their viability for four years only; in the hexaploid species, percentage germination after five years was 14–33%.

2888 Karaul'nyj-Zverev, N. V.
[The effect of external conditions upon development of two panicles by oats. (A study of the question of breeding oat forms having two panicles)].
Trud. Belorussk. sel'skohozjajstv. Akad. (Trans. White Russ. agric. Acad.) 1957 : **24** : No. 2 : 3–21. [Russian].

An extended account of a report already summarized is given [358].

2889 Jensen, N. F.
Breeding winter oats for New York.
Fm. Res. 1958 : **24** : p. 6.

At Ithaca, NY, a single plant showing unusual winter hardiness was found in 1944 and designated CI5364. In 1949–50 this line was crossed with a number of other varieties and in trials in 1956 and 1957 some selections resulting from this programme gave excellent yields and showed small but significant increases in hardiness.

2890 Hooker, A. L.
Septoria reactions of oat varieties and selections in 1957.
Plant Dis. Reptr. 1958 : **42** : 20–25.

Information is given on the leaf, stem and kernel reactions of many varieties and experimental selections to *S. avenae* (*Leptosphaeria avenaria*), when artificially inoculated in the field at Madison, Wis. Wide differences in susceptibility were found, some varieties and selections having low percentages of infection.

2891 Simons, M. D. *et al.*
Further observations on races of crown rust attacking the oat varieties Landhafer and Santa Fe.
Plant Dis. Reptr. 1957 : **41** : 964–69.

Landhafer and Santa Fe are susceptible to races 263, 264, 276 and the new race 290, referred to as the Landhafer races. No source of seedling resistance to race 264 was discovered among about 5000 lines of cultivated oats from the world collection. Data from greenhouse tests at the heading or later stages suggested, however, that adult-plant reaction to the Landhafer races merits further study. Treatment of the seed of Mo. 0–205 with X rays or thermal neutrons did not induce any mutants resistant to race 264. In 1957 at Quincy, Fla., where the crown-rust races occurring naturally included race 264, CI17233 (*Avena abyssinica*) and the hexaploid oats CI7171 (Selecta DL41372) and CI17172 (DLM3) were outstanding for their adult-plant resistance.

2892 Simons, M. D.
Physiologic races of crown rust of oats identified in 1956-57.
Plant Dis. Reptr. 1957 : **41** : 970–72.

Data are provided on the prevalence and distribution of 23 races of *Puccinia coronata* var. *avenae* in the USA during 1956. Race 202 was again the most common, accounting for 33% of the isolates from uredial collections [cf. XXVII, 1668].

2893 Craigmiles, J. P.
Oat disease studies.
Tech. Bull. Ga. agric. Exp. Sta. 1956 : No. N.S.7 : Pp. 36.

Isolates of *Helminthosporium victoriae* from oats in Georgia were found to differ in morphological and physiological characters and in their virulence on different oat varieties. Susceptibility to *H. victoriae* was controlled by a single dominant gene. Victoria, Santa Fe, Landhafer [Land oats] and Trispernia each had a single dominant factor responsible for resistance to race 45 of *Puccinia coronata* var. *avenae*. The Victoria type of resistance is considered the most effective although it is linked with susceptibility to *H. victoriae*. Linkage between glabrous nodes and resistance to race 45 was found in the cross Appler x Victorgrain. In two *Avena sativa* x *A. byzantina* crosses the number of basal hairs on the grain was mainly controlled by a single factor; no or few hairs was dominant to numerous hairs.

2894 Rosen, H. R. & Spencer, J. A.
Avena abyssinica susceptible to _Helminthosporium_ blight.
Plant Dis. Reptr. 1958 : **42** : 238–39.

A. abyssinica ‘CI7233’, of interest as a possible source of resistance to crown-rust races attacking Landhafer, has exhibited susceptibility to *Helminthosporium* blight. It is concluded that the blight pathogen has a considerably wider host range than has been assumed and that the reduction of the specific designation *H. victoriae* to *H. sativum* var. *victoriae* would be justified.

RYE

2895 Bojňanský, V.
Vliv kozmického žiarenia na rastliny. (**The effect of cosmic radiation upon plants**).
Čsl. Biol. 1957 : **6** : 136–41.

The progeny of a single *Secale cereale* plant was exposed to cosmic rays at an altitude of 2640 m. for a period of 18 days starting at the germination stage. The plants showed great variability with regard to most quantitative characters, including length of ear and grain yield per plant. The treatment also gave rise to mutant forms. Some of these had culms with two branched ears, others were characterized by sturdy habit, culms of even length and well formed grains.

2896 Kiss, Á.
Rozsnemesítőink új, fontos alapanyaga. (**New important basic material for our rye breeding**).
Agrártudomány 1957 : **9** : No. 12 : 25–28.

The Kisvárda tetraploid rye developed in Hungary is described. The material shows medium fertility with $2n = 28$ and regular meiosis. It includes vigorous lines with large grain, high 1000-grain weight and good straw strength, disease resistance, hardiness and germination. Tillering is usually poor or, if not, is combined with very low fertility.

2897 Sarić, M. R.
Proučavanje efekta zračenja u zavisnosti od fenomena poliploidije. I. Uticaj zračenja X zracima na rast i razviće ponika diploidne i tetraploidne forme petkus ozime raži. (**Studying the effect of radiation in connexion with polyploidy phenomena. I. The effect of X irradiation upon the growth and development of shoots in diploid and tetraploid forms of Petkus winter rye**).
Arch. poljopr. Nauk 1957 : **10** : No. 29 : 58–63.

As shown by the effects on seedling growth, 4*n* seed of Petkus was more resistant to X irradiation than 2*n*.

2898 Banneick, A.
Anbauversuche mit tetraploiden Roggen auf verschiedenen Standorten Mitteldeutschlands. (**Cultural trials with tetraploid ryes at various stations in Central Germany**).
Z. Acker- u. PflBau. 1958 : **105** : 226–38.

Three tetraploid ryes equalled a diploid variety in yield on loamy soils but on clay and sand the tetraploids were inferior and they were particularly susceptible to lodging caused by heavy rainfall. An application of 120 kg. per ha. of nitrogen fertilizer caused a greater increase in the protein content of 4*n* rye than of 2*n* rye; the harvest in green fodder is slightly later from the tetraploids.

2899 Nuttonson, M. Y.
Rye-climate relationships and the use of phenology in ascertaining the thermal and photo-thermal requirements of rye. Based on data of North America and of some thermally analogous areas of North America in the Soviet Union, Finland, Poland, and Czechoslovakia.
Amer. Inst. Crop Ecol., Washington 1957 : Pp. 219.

An analysis of extensive phenological data already available from observations on rye varieties at agricultural experiment stations in the above regions has indicated the possibility of using such data in conjunction with meteorological and day-length records (1) to disclose the thermal and photothermal requirements of both winter and spring rye under uncontrolled field conditions, (2) to provide a means for a physiological-thermal classification of varieties and (3) to develop criteria for predicting dates of heading and maturity.

MAIZE

Leistung und Bedeutung des Maises als Futterpflanze. (**The performance and importance of maize as a fodder plant**).
Arbeit. DLG., Frankfurt am Main 1957 : **47** : Pp. 82.

2900 *Graeber, W. Bundes-Mais-Anbauversuche 1954–1956.* (*Federal maize field trials, 1954–1956*). (*pp. 16–38*).

The results are reported of varietal trials held at five centres in Federal Germany with eight varieties of fodder maize. Details are provided of the rate of development, yield of fresh and and dry matter and protein and sugar content of leaves, stems and spikes of the varieties tested.

2901 *Zscheischler, J. Grünfutter- oder Silomais in Bayern?* (*Green fodder or silo maize in Bavaria?*) (*pp. 39–49*).

Tabulated data are presented on the yields of fresh and dry matter obtained from some midseason and late varieties of maize tested as a crop for silage in Bavaria.

2902 *Schnell, F. W. Ergebnisse und Aufgaben der Saatmais-Importprüfungen.* (*Results and problems of testing imported maize seed*). (*pp. 76–82*).

Details are provided on the growth period and yielding capacity with respect to fresh and dry matter of 35 imported maize varieties tested during 1956 and 1957 in Federal Germany.

2903 El Khishen, A. A. [Al Khishin, 'A. 'A.] & Kassem, E. S. [Kassim, A. S.]
Yield tests on some local and introduced maize hybrids in Egypt.
Alexandria J. agric. Res. 1957 : **5** : No. 2 : 55–65.

Comparative trials have been carried out at three localities in Egypt using 24 local double crosses produced by the Plant Breeding Section of the Egyptian Ministry of Agriculture and a number of introduced crosses from the USA, with open pollinated American Early as control. A local hybrid, GH76, showed the widest range of adaptation and gave the highest yields.

Mejoramiento del Maíz. Segunda Reunión Centroamericana, Turrialba - Costa Rica, 11-15 de diciembre de 1955. (**Maize breeding. Second Central-American Meeting, Turrialba, Costa Rica, 11-15 December 1955**) : Pp. 172. (Mimeographed).

The meeting in question took the form of a series of round-table discussions, the summaries of which are presented in this volume.

2904 *Organización de un programa de mejoramiento de maíz.* (*Organization of a programme of maize breeding*). (*pp. 15–19*).

The first important step was considered to be the collection of as many as possible of the local varieties in each country; the Rockefeller Foundation offered the cooperation in this respect of the banks of germ plasm established in Mexico and Colombia and the respective countries were asked to study the behaviour of the varieties in a number of different localities.

2905 *Métodos para mejorar variedades.* (*Methods of improving varieties*). (*pp. 21–24*).

The method of mass selection led to no appreciable improvement in ear length, grain percentage or yield when applied to I–452. Intervarietal crossing has led to yield increases when good parents of different types are crossed, for instance flint x dent or starchy x dent. The success of the ear-to-row method in increasing oil or protein content and its ineffectiveness in raising yield are illustrated by reference to the Illinois experiments.

2906 *Métodos empleados para obtener variedades sintéticas e híbridos.* (*Methods employed in obtaining synthetic varieties and hybrids*). (*pp. 25–27*).

The advantages of synthetics were considered to be greater range of adaptation than double or triple crosses, better yield than open-pollinated varieties, ease of seed production, the possibility of sowing them without renewing the seed annually and finally, their value in conserving germ plasm. Lower yield than double and triple crosses and greater difficulty of detecting contamination were noted among their disadvantages. They were considered more acceptable in Central America than double or triple crosses and the method of convergent improvement was recommended for producing them.

2907 *Producción de semilla mejorada.* (*Production of improved seed*). (*pp. 29–31*).

The systems of seed production and distribution in the different countries of Central America were described and the opinion was expressed that distribution by private undertakings with supervision by official technical bodies is the most efficient for maize seed.

2908 *Ensayos uniformes de rendimiento y colecciones, y ensayos nutricionales.* (*Uniform tests of yield and collections, and nutritional tests*). (*pp. 39–43*).

Tests of open-pollinated varieties and hybrids carried out in the different countries at altitudes from 0 to 900 m. have shown the superiority of the hybrids produced in Mexico, Colombia and Cuba; this result demonstrates the great possibilities that exist for cooperative effort in the production of hybrids adapted to the plains in the different countries of Central America.

The nutritional properties of the varieties in the collections are being investigated by the Instituto de Nutrición de Centroamérica y Panamá [Nutrition Institute of Central America and Panamá].

2909 *Ensayos uniformes de rendimiento.* (*Uniform yield tests*). (*pp. 45–172*).

Tabular data are given showing the yields, time of maturity and resistance to *Helminthosporium* spp., *Puccinia* spp. and lodging of the collections of white and yellow varieties respectively, in the different participating countries.

2910 BOCANEGRA, S.
Ensayos inter-departamentales con híbridos y variedades de maíz 1955–56. (**Interdepartmental trials of maize hybrids and varieties, 1955–56**).
Bol. Estac. exp. agríc. La Molina 1957 : **31** : No. 362 : 1–9.

Information on the performance of nine double hybrids, two varieties and a local maize tested in the Virú, Casma and Ate valleys in Peru is presented. The double hybrids 2 and 4, both with the hybrid La Molina 3 as female parent, did particularly well. Details are also given of the results of trials of top crosses between breeding lines and commercial varieties.

2911 COE, E. M. (JUN.)
Anthocyanin synthesis in maize—a gene sequence construction.
Amer. Nat. 1957 : 381–5.

Further studies of the factors controlling anthocyanin synthesis in maize endosperm [cf. XXV, 2982 and XXVI, 1232] have made possible the provisional construction of a sequence of gene action, as follows, (C_1R); In; A_1; Bz; A_2. The effects of the gene Pr are expressed before those of A_2 but its exact position in the sequence is not known.

2912 POLLAK, E., ROBINSON, H. F., & COMSTOCK, R. E.
Inter-population hybrids in open-pollinated varieties of maize.
Amer. Nat. 1957 : **91** : 387–91.

The performance of all possible crosses and back crosses among Jarvis, Indian Chief and Weekley indicated the operation of heterosis in respect of yield, as indicating fitness, in the F_1 while the performance of the F_2 was intermediate between those of the parents and the F_1, in contrast to results obtained with *Drosophila* where the F_2 was equal or inferior to the parents in characters relating to fitness. The results are interpreted as evidence for the importance of epistasis.

2913 Gamble, E. E.
Relative importance of epistatic and nonepistatic gene effects in maize.
Iowa St. Coll. J. Sci. 1957 : **32** : 178–79. (Abst.)

The inheritance of yield, plant height, kernel row number, ear length, ear diameter and 100-kernel weight was studied in six inbred maize lines and 15 F_1, 15 F_2 and 30 back-cross progeny. In all cases nonepistatic gene action was relatively more important than epistatic gene action, especially in the case of yield and when the four generations were analysed together. The results suggest that epistatic gene action was influenced more by environmental factors than was nonepistatic gene action, that some inbreds contributed more epistatic gene action than others and that a relation exists between the incidence of epistasis in a cross and the degree of heterosis.

2914 Fenaroli, L.
Gli sviluppi della maiscoltura in Austria e l'Istituto sperimentale per le sementi di Gleisdorf. (**The development of maize cultivation in Austria and the Gleisdorf Seed Research Station**).
Maydica, Bergamo 1958 : **3** : 15–20.

A description is given of the institute at Gleisdorf and of its activities before its new site was inaugurated in October 1957. As in Italy, the best hybrids are proving to be those between American dents and local flint maizes, many hybrids having given yield increases of 10% over the best hybrids from the USA and 30% over the local open-pollinated varieties.

2915 Gosi, L.
Cento quintali per ettaro con un granoturco ibrido italiano. (**A hundred quintals per hectare with an Italian hybrid maize**).
G. Agric. 1958 : **68** : p. 46.

Hybrid maize selections have given average yields exceeding those of local varieties by 32·36 q. per ha. when irrigated and 3·22 q. per ha. without irrigation in the province of Teramo, Italy.

2916 Landi, R.
I primati del mais e la stabilizzazione delle rese. (**Record yields of maize and the stabilization of yields**).
G. Agric. 1958 : **68** : p. 61.

Figures are given showing that the introduction of hybrid maize in Italy raised the record yields from the vicinity of 50 c. per ha. to over 100 c., yields of up to 177 c. having been attained in recent years; though the highest yields often come from the hybrids that mature latest, this has not always been the case and some very good results are recorded from hybrids such as U41, with a maturity rating of 700.

2917 La diffusione dei mais ibridi in Italia nel 1957. (**The extent of cultivation of hybrid maize in Italy in 1957**).
Maydica, Bergamo 1958 : **3** : 23–25.

Tabular data are given showing the area sown with hybrid maize, and its proportion to the total maize area, in different parts of Italy in 1957.

2918 Brandolini, A.
Le ultime novità in campo agricolo: i mais ibridi. (**The latest developments in the agricultural field: hybrid maize**).
Sci. e Lav. 1956 : 37–52.

After describing methods of producing hybrids, the importance of hybrid maize in Italian agriculture and its present distribution throughout Italy, the author mentions current breeding work in this field. The development of flint and dent x flint hybrids is in progress and the first of the latter group, Insubria 521, (WF9 x 38–11) x (Lo3 x Lo32), has already given excellent yields in irrigated fields in the Po region. Other hybrids in the same series showed vigorous growth in the cold spring of 1956 when growth of the dent hybrids was arrested. In central-southern and peninsular Italy the dent x flint hybrids have also shown their superiority in respect of yield and resistance to hot, dry conditions and their adoption has resulted in a rapid increase in grain production.

2919 Galeev, G. S.
(**At the Kuban' Experimental Station of the Institute of Plant Industry**).
Kukuruza (Maize) 1957 : No. 12 : 27–31. [Russian].

Descriptions are given of a number of double-cross hybrids that have been released by the station. VIR42 [Institute of Plant Industry 42] gives high yields of grain of uniform ripeness and is resistant to smut. VIR25 is a few days earlier than VIR42 and is resistant to smut but not to lodging. VIR156 is a late type and surpasses all others in yield of green matter; its leaves remain green when the grain is ripe and it is resistant to smut and lodging.

Of the newer hybrids VIR281, which ripens at the same time as VIR42, exceeds it in resistance to drought and lodging and gives some 2 c. per ha. more grain. VIR267 also ripens at the same time as VIR42 but exceeds it in standing capacity; it is suitable for moist soils.

Several other hybrids still under observation are described briefly; they excel the above in earliness, standing capacity, drought resistance or yield of grain or green matter. These improvements have been effected by replacing line 43 in the double cross constituting VIR42 by other lines that have proved superior in test crosses. Since 1953 use has been made of somatic male sterility which was found in certain lines from Moldavia and Osetia and has now been transferred to most of the other breeding lines. This is a different type of male sterility from that found in lines obtained from Texas and by a judicious combination of the two types it has been possible to build up two single crosses, each of which can be produced without detasselling, that mutually restore fertility when intercrossed.

2920 Musijko, A. S. & Ključko, P. F.
(Breeding and seed-production work with maize).
Kukuruza (Maize) 1957 : No. 12 : 32–36. [Russian].

By open pollination between lines of the Grušev maize from Moldavia a form has been produced which exceeds the original Grušev by 4·6 c. per ha. in grain yield, its average yield in 1949 being 40·5 c. per ha. It is a yellow flint type tolerant of low spring temperatures and has been named Gruševskaja Odesskaja [Odessa Grušev]. A good drought-resistant hybrid has been produced by crossing this variety with Dnepropetrovsk maize. The Lysenko Institute for Plant Breeding and Seed Production at Odessa has also produced a hybrid, Odessa 10, by open pollination between Liming Kubanskij [Kuban' Leaming], Dnepropetrovsk and Minnesota 13 Extra; it has exceeded VIR42 [Institute of Plant Industry 42] in yield of green matter, in which respect it is equal to VIR156, and in grain yield; this hybrid too is tolerant of low spring temperatures.

Other intervarietal hybrids produced at the institute have exceeded VIR42 in grain yield while ripening 10–12 days sooner. Crosses between early and late-maturing varieties mostly produced hybrids intermediate between the parents in earliness, not earlier as predicted by Lysenko. Work has now been started on producing early-maturing lines by inbreeding the local flint varieties. Experiments are reported which show that better double-cross hybrids are obtained by crossing the first-generation single-cross hybrids than by crossing later generations.

2921 Kozubenko, V. E.
(Our achievements).
Kukuruza (Maize) 1957 : No. 12 : 37–39. [Russian].

The drought-resistant maize Zubovidnaja 3135 [Dent 3135], a selection from Minnesota 13 Extra, has been used as pollen parent, with the flint variety Voronež 76 as seed parent, to produce the hybrid Bukovina 1, distinguished by earliness, yield and drought resistance. Bukovina 2, a hybrid from Voronež 76 x a selfed line from Černovicy 21, ripens 5 days earlier than Bukovina 1 and exceeds it by 1·2 c. per ha. in grain yield. Bukovina 3, a hybrid of the flint variety Glorija Janeckogo [Janeckij's Glory] x dent line VIR44 [Institute of Plant Industry 44], exceeds Bukovina 1 by 10·2 c. per ha. in grain yield but ripens 5 days later; it is tolerant of low temperatures in the spring. Some promising double-cross hybrids are being tested.

2922 Osadčij, V. P.
(Let us increase the production of hybrid seed).
Kukuruza (Maize) 1957 : No. 12 : 40–41. [Russian].

It is reported that in 1957 the whole of the maize area in the Dnepropetrovsk province of the Soviet Union was sown with first-generation hybrid seed, such hybrids as VIR42 [Institute of Plant Industry 42] and VIR25 having yielded 8–12% more than the open-pollinated varieties.

2923 Sidorov, F. F.
(The world collection of maize at the Institute of Plant Industry).
Kukuruza (Maize) 1957 : No. 11 : 51–54.

The Leningrad maize collection now comprises some 13,000 specimens, from 64 different countries and representing almost all subspecies; about 10% of the collection consists of selfed lines and hybrids, the rest being open-pollinated varieties. Some of the accessions have gained popularity in cultivation in the USSR, as in the case or Minnesota 13, Minnesota 23 and Krug, and several others have formed the basis of successful hybrids. Some of the characters of value for plant breeding that have been found in the collection are enumerated and a number of the double-cross hybrids, based on material from the collection, that are now under cultivation in various parts of the USSR are referred to; a series of hybrids between early-maturing varieties and good inbred lines, designed to produce hybrids of greater earliness, is now being tested.

The Texas type of male sterility has been found to be more stable in inheritance than the Moldavian type.

2924 Genčev, G. & Marinkov, E.
(Aims and methods in breeding work with maize in Bulgaria).
Naučn. Trud. selskostopan. Akad. Georgi Dimitrov agronom. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1957 : **4** : 57–100. [Bulgarian].

This account of breeding heterotic hybrids at the Georgi Dimitrov Institute includes observations on such topics as the use of selectivity of fertilization in the production of inbreds and methods for testing combining ability and maintaining heterosis. Some local strains are thought to have breeding value. Data are given on trials of diverse material, including the hybrid 49 x 145 and the synthetic P3 during 1952–55, both of which outyielded the standard 145.

2925 Alexander, D. E.
Report to the Government of the Federal People's Republic of Yugoslavia on maize breeding and hybrid seed production.
FAO UN, Rome 1958 : FAO/58/1/301 : No. 775 : Pp. 6. (Mimeographed).

The report analyses the problems facing hybrid-maize breeders in Yugoslavia and recommends ways in which these problems may be tackled.

2926 Bhatnagar, M. P.
Here's hybrid maize for Rajasthan.
Indian Fmg. 1957 : **7** : No. 9 : p. 32.

In trials at the Maize Breeding Station, Udaipur, the mid-early American dent hybrid US13 has outyielded the local variety and improved open-pollinated varieties. The mid-early open-pollinated flint types Bassi Selected and Udaipur Selected, developed by the Rajasthan Agricultural Department, are also recommended. Respectively yellow and white, these varieties are fairly resistant to smut, downy mildew and corn borer. Malan, a semident white variety, gives an outstandingly high yield in Kumbalgarh, a region with an altitude of 3000 ft. and annual rainfall of 35–40 in. Since it is very late in maturing, it is unsuitable for general cultivation. This variety is likely to be a valuable parent in developing hybrid maize.

2927 Harrison, M. N.
Reliable maize hybrids take at least 15 years to breed.
E. Afr. Fmr. & Planter 1957 : **1** : No. 12 : 43–44.

The problem of hybrids *vs.* synthetics for Kenya is discussed with reference to experience in other countries in Africa, as described at the Fifth Annual Maize Breeders' Conference of the Union of South Africa [404].

2928 **Maize hybrids are more difficult to breed than synthetics.**
E. Afr. Fmr. & Planter 1957 : **1** : No. 8 : 49–50, 61.

Attention is drawn to the advantages of synthetics over hybrids for Kenya, in view of the conditions and current resources of that country. Breeding in now concentrated upon the development of synthetics.

2929 **Director's Annual Report of the Central American Cooperative Corn Improvement Project 1956:** Rockefeller Found., NY : Pp. 29.

Co-operative yield trials of maize varieties and hybrids continued. Within the last two years all but one of the participating countries has initiated a programme of local seed production.

Tropical Research Center, Veracruz, Mex.

Work at the above station continued to expand in accordance with the objectives of developing improved maize for the humid tropical areas of Mexico and S. America and of providing breeding material for the programmes of individual countries. Valuable sources of germplasm have been discovered by screening native varieties.

Costa Rica

Chief emphasis is being laid on breeding for mild and hot humid tropical regions. In view of the growing demand for improved varieties for the Pacific coastal plain, selection has been initiated at Las Delicias Experiment Station as the first step in the development of synthetics.

El Salvador

Breeding continued at the two principal stations at San Andrés and Santa Cruz Porrillo. At the former station the major objective has been the development of short-season maize. The second hybrid to be produced, a short-season white type, was released in 1956.

Guatemala

At Cuyuta, with an altitude of 300 ft., breeding is in progress to produce maize adapted to areas between sea level and 3000 ft. Breeding for regions of medium altitude (3000–5500 ft.) is conducted at Guatemala City. At Quezeltenango, breeding is designed for still higher altitudes. A list of recommended varieties has been prepared. An improved native variety has been released from Quezeltenango. In 1957 the first improved maizes originating from local breeding were due for release. Limited distribution of adapted modified hybrids for the coastal region and medium altitudes is planned.

Honduras

Activities included trials of collections to select material for the proposed breeding project.

Nicaragua

At the main station in Managua, the programme was extended to include selection within native varieties, testing of intervarietal crosses and development of lines for synthetics, the chief emphasis being laid on short-season maize.

Panama

Testing was continued by the National Institute of Agriculture in Divisa. The US Operations Mission began a testing programme on the adaptation of varieties and hybrids in the western area.

Inter-American Institute of Agricultural Sciences, Costa Rica

Activities included the initiation of the development of a well-adapted synthetic for lowland districts.

Institute of Nutrition of Central America and Panama

At the above institute, Guatemala City, study of the nutritional constituents in maize, including 25 of the varieties and hybrids from the uniform yield trials, continued.

2930 GROGAN, C. O. & ZUBER, M. S.

Comparative performance of various combinations of F_1 and F_2 generation seed of maize.

Agron. J. 1958 : **50** : 88–89.

The presence of 20% or more of F_2 seed of the single-cross parent in the F_1 seed of a double cross was necessary to obtain a significant reduction in yield, compared with the 100% F_1 double-cross seed. The magnitude of the reduction did not however provide support for the view that the differences sometimes found in the yield of a double cross with seed from different sources may be attributed to faulty detasselling. Much of the reduction in yield due to F_2 plants is apparently overcome by the greater competitive growth of the more vigorous F_1 hybrids. It is further suggested that the loss in yield depends on the F_2 single cross since considerable differences occur among single crosses in reduction in F_2 yield.

2931 HUBER, L. L.

Wanted—corn hybrids with built-in features.

Sci. Fmr., Pa. 1957 : **5** : No. 2 : p. 3.

Some desirable characteristics of hybrid maize lines and factors influencing the choice of inbreds are briefly discussed in this popular article. Tabulated data are included showing the "strength" of root and stalk and reactions to blight, aphids and drought of 39 inbreds used in hybrids recommended by Pennsylvania State University.

2932 PASS, H. & BROOKS, J. S.

Performance tests of corn varieties and hybrids, 1957.

Misc. Publ. Okla. Exp. Sta. 1958 : No. MP–50 : unpaginated.

The results of trials of 98 commercial and experimental hybrids of maize in five localities in Oklahoma are summarized.

2933 NEAL, N. P. & STROMMEN, A. M.

Supplement to Wisconsin corn hybrids.

Bull. Wis. agric. Exp. Sta. 1958 : No. 476 : Suppl. : Pp. 16.

This supplement gives data on the performance of maize hybrids in trials in 1956 and 1957 and discussions of various aspects of production of the crop in Wisconsin, including the use of male-sterile and pollen-restoring lines [cf. XXVII, 1713].

2934 FARQUHARSON, L. I.

Hybridization of *Tripsacum* and *Zea*.

J. Hered. 1957 : **48** : 295–99.

Success has been gained at Franklin College, Ind., in crossing $2n$ and polyploid *T. dactyloides* as ♀ with *Z. mays*, one hybrid in flower, several putative hybrids and numerous seeds having been secured. No special techniques were employed, although a higher percentage of mature embryos was obtained by embryo culture. Crosses with maize varieties grown by Indians in Peru and in the south-west of the USA were the most successful. The hybrid which has flowered was derived from $3n$ *T. dactyloides* x the Peruvian maize Puno. Since it has $2n = 60–64$, it is assumed to be the result of fertilization of an unreduced egg by a reduced gamete of maize. Ten univalents longer than those of the ♀ parent were recognizable at meiosis and are presumed to be the chromosomes of maize. Shorter univalents, frequently eight in number, and occasional multivalents were also observed, together with 21–22_{II}. The hybrid is perennial and morphologically resembles the ♀ parent much more closely than the ♂. The pollen is inviable and no viable seeds have been set when the hybrid has been pollinated by *T. dactyloides* and *T. floridanum*. Two spikelets have set seed after application of sweet-corn pollen; the seeds are however somewhat shrivelled and will probably fail to germinate. It is suggested that *Tripsacum* and the more primitive races of maize may occasionally cross under natural conditions.

2935 Osler, R. D., Wellhausen, E. J. & Palacios, G.

Effect of visual selection during inbreeding upon combining ability in corn.

Agron. J. 1958 : **50** : 45–48.

Experiments were carried out at the Chapingo Experiment Station, Mexico, on 134 pairs of crosses representing local x local, local x introduced and introduced x introduced. One cross within each pair was a combination of S_1 lines while the other was a cross of the corresponding advanced inbred lines. Local lines were derived from varieties collected in the vicinity of the station. Introduced lines originated from varieties from regions similar in altitude to Chapingo in neighbouring states. Selection for ear appearance was based on a general rating for such characters as freedom from disease, uniformity, depth of grain, straightness of kernel row and conformity to desired ear type. Selection for plant appearance was based on a general rating which included disease and lodging resistance, uniformity and vigour. Selection was also made for yield. Improvements in yield, ear and plant were obtained in 57, 60 and 41% of the hybrids respectively. Selection for yield and ear appearance was more effective in introduced than in local lines whereas in the case of plant characters selection was more effective in local lines.

2936 Katayama, Y. & Nagatomo, T.

(On a variegated maize strain).

Miyazaki Daigaku Nogakubu Kenkyu Jiho/Bull. Fac. Agric. Univ. Miyazaki 1957 : **2** : 52–58. [Japanese].

The inheritance of leaf colour in the F_0–F_3 of a cross between a popcorn with white-striped leaves and a normal strain is described. Variegation appeared to be determined by one or more cytoplasmic factors.

2937 Sass, J. E.

Histolytic polyploidy in root tips of maize.

Proc. Iowa Acad. Sci. 1957 : **64** : 213–17.

A few seedlings in a sample of the Hopi Indian maize from New Mexico showed cavities in the root tip, the following sequences of events being observed; (1) enlargement of stelar initials; (2) lysis of cell walls; (3) formation of giant polyploid nuclei and smaller nuclei; and (4) necrosis of the cytoplasm.

2938 Graf, G. E.

Chromosome breakage by maleic hydrazide and maleic hydrazide derivatives in strains of maize with different knob numbers.

Iowa St. Coll. J. Sci. 1957 : **32** : p. 181. (Abst.)

Evidence is presented supporting the hypotheses that maleic hydrazide causes breakage selectively in heterochromatin and that breakage is due to the reaction of maleic hydrazide with sulphydryl groups, although the related compound N-ethyl maleimide, which also reacts readily with sulphydryl groups, does not cause significant breakage. A strong positive correlation was found between knob number and anaphase bridges after treatment with maleic hydrazide and its N-acetyl derivative but none after X-irradiation, suggesting a fundamental difference in the type of breakage resulting from the two treatments. The activity of N-acetyl, N-caproyl and N-benzoyl derivatives with respect to chromosome breakage appears to be positively related to the size of the side chain. The production of persistent nucleoli in maize by maleic hydrazide and its N-derivatives has been confirmed.

2939 Inman, L. L.

Studies on the methods of production and theoretical applications of large rings of chromosomes in maize.

Diss. Abstr. 1957 : **17** : Publ. No. 22, 459 : p. 1874. (Abst.)

Multiple-translocation stocks giving rise to progeny with a ring of six chromosomes were obtained among the derivatives of crosses between stocks with translocations having one chromosome in common. They resulted from crossing over in the differential segment in the common chromosome. They could be detected by the high degree of pollen sterility of plants obtained from crosses of the F_1 with normal individuals; the presence of rings of six was verified by cytological examination of the PMCs. Another method studied included the use of genetic markers which were closely linked to the breakage points in the two chromosomes not common to the two translocations. Each marker gene is introduced, not into the stock which has a translocation for the chromosome on which the marker is situated, but into the translocation stock in which that chromosome is normal. Recombinations between the two markers should in most cases be cross overs in the differential segment.

A multiple-translocation stock producing a ring of eight chromosomes was obtained from a test cross of the F_1 between two ring-of-six multiple-translocation stocks having one translocation in common. The F_1 of this cross [(2—3d + 2—4b) x (2 — 4b + 4—8a)] had two rings of four. As indicated by cytological examination, the progeny of the cross of this F_1 with a normal stock included plants with a ring of eight, six or four chromosomes. Theoretically, by an extension of this technique, component multiple-translocation stocks could be combined to produce a ring including the entire chromosome complement, while at the same time avoiding a higher degree of sterility than the 75% expected in the case of two rings of four.

In the case of a species with an even haploid number it was demonstrated by diagrams that progeny with two rings may be expected from a cross between a stock having a normal arrangement and a homozygous multiple-translocation stock possessing a translocation on each arm of every chromosome of the complement. In addition, the rings would be interdependent owing to the presence of homologues of each differential segment in the two rings. Interdependent rings may be of interest for studies of chromosome pairing. "In such a species, a multiple translocation stock with a translocation in all arms but one will produce a ring including all the chromosomes. In a species with an odd haploid number, a stock with a translocation on every arm will produce a ring with all the chromosomes." A proposal is outlined for the production of chromosome substitution lines by the use of large rings.

2940 MOHAMED, A. H. [MUHAMMAD, ʻA. H.]
The use of chromosomal interchanges in locating the genes controlling some agronomical characters in maize.
Alexandria J. agric. Res. 1956 : **4** : No. 11 : 69–82.

The author has continued at Alexandria studies originally started in Minnesota [cf. XXV, 292]. A sweet-corn inbred S4 was crossed with ten interchange lines and back crosses were made to S4. The association data indicated the presence of at least two genes controlling silking date, one in the long arm of chromosome 3 and the other in the short arm of 4; a gene for pollen shedding was also found in this latter region. There appeared to be a gene for tillering in both the long and short arm of chromosome 10. Some of the associations found in Alexandria differed from those found in Minnesota, indicating that the expression of quantitative characters is influenced by the environment.

2941 ELITROPI, C.
Contributo alla conoscenza della biologia fiorale e della tecnica d'impollinazione artificiale del mais (*Zea mays* L.). Parte II. Parte III. (**A contribution to the knowledge of the floral biology and methods of artificial pollination in maize. II and III**).
Ann. Sper. agr. 1958 : **12** : 5–54.

In the second of this series [cf. 1628], environmental factors affecting tassel development, pollen shedding, silking, pollination, fertilization and the duration of pollen viability are discussed. Tables are included showing the duration of stigma receptivity in four isogenic lines and duration of pollen viability in two single crosses and several double crosses.

More detailed studies of conditions affecting fertilization are described in the third paper and tabulated data showing the length of flowering period and other floral characters in 42 isogenic lines are presented. Further tables show the effect on percentage fertilization of method of pollination, temperature, humidity, time of day and stage of flowering in several isogenic lines and the significance of the results obtained is discussed in detail for each line studied.

2942 ZUBER, M. S. *ET AL.*
Breeding high amylose corn.
Agron. J. 1958 : **50** : 9–12.

Breeding maize hybrids with starch high in amylose content presents difficulties since such hybrids usually have defective endosperm and low yield. From the open-pollinated variety Cassel, an inbred has been isolated which carries a gene, ha_2, for high amylose content (34·8–37·0%). The designation ha_1 is proposed for the gene for the same character discovered by Kramer *et al.* [XXVI, 3290]. In the present investigation, the amylose content of the ha_1 strain was estimated as 47–48·8%. The kernels of each strain may be distinguished by their tarnished appearance. In endosperm development both strains resemble normal dent. The

F_1 of ha_1 x ha_2 had about 27% amylose; thus it was established that the two genes are non-allelic. The yellow, tarnished and wrinkled kernels from an F_2 ear of ha_2 x ha_1 had an amylose percentage of 61·6. These kernels apparently represented the predominantly double recessive group. The amylose content of 39 F_3 ears from this cross ranged from 25·4 to 70·3%. It is assumed that the single ear with 70·3% approached the value of the double recessive. Transference of ha_1 and ha_2 to standard inbreds is under way. In one inbred (K55) undergoing conversion to ha_1, the amylose content of some ears has reached 67·7%; the increase over the ha_1 parent is ascribed to modifiers from K55. Some of the strains with amylose percentages above 60% have produced kernels nearly normal in size and weight but their yielding capacity in comparison with normal dent corn has not yet been determined.

2943 Notani, N. K.
The induction and evaluation of endosperm mutations in maize.
Diss. Abstr. 1957 : **17** : Publ. No. 22, 280 : 1864–65. (Abst.).

Investigations were carried out to explore the possibility of enhancing the amylose fraction of the endosperm by ultraviolet-induced mutation and by mutation arising as the result of transposition of *Ds*.

The majority of mutations induced by treating the inbred M–14 and the dent single cross CC5 x L317 with ultraviolet rays were of the defective type.

Stocks carrying the system *Ds–Ac* were crossed as pollen parents to a commercial stock with sugary endosperm and to CC5 x L317. In the case of the outcross to the sugary stock, the F_1 kernels were scored for sugary sectoring; plants derived from the selected kernels were selfed and the F_2 was screened for the true-breeding behaviour of the selected kernels. Two mutations for the sugary condition were obtained from the cross sugary x *Ds–Ac*. One was probably not due to transposition of *Ds* since activity of this component appeared to be present at the standard locus. In the case of the other mutation, no activity of *Ds* at the standard locus was detected. In addition, seven starchy kernels were associated with the second mutation; these are ascribed to germinal reversions of the mutation induced by the *Ds–Ac* system. Another ear had a ratio of 3 sugary : 1 starchy. Two possible explanations are suggested: *Su* may have been changed by *Ds–Ac* so that it behaved as a recessive to *su*, or mass reversion of the mutation induced by *Ds–Ac* at the locus for the sugary condition may have occurred in a sector of sporogenous tissue.

A "translucent" mutant with at least 8% more amylose than normal and a floury mutant were obtained from the dent outcross. The *Ds–Ac* control of these was established, a suggestion being made for the rapid screening of mutations induced by this system. From data on the F_2 of the dent outcross, the position of *Ds* in the original stock was estimated as 10·89 map units to the right of the locus for waxiness. Finally, it was found that sectoring in the F_1 of the sugary outcross was not due to the effect of *Ds*.

2944 Pfahler, P. L.
Genetic control of starch properties in maize.
Diss. Abstr. 1957 : **17** : Publ. No. 22, 286 : p. 1865. (Abst.).

As already reported [cf. XXVII, 4005], the starch granules of the endosperm genotype su_2 have the lowest birefringence endpoint temperature while those of the *ha* genotype had the highest. The genes su_2, *ha* and *du* had dosage effects on endpoint temperature; increasing doses of *ha* in the endosperm caused a rise in the endpoint temperature of the su_2 genotype whereas increasing doses of *du* lowered the endpoint temperature of the *ha* genotype. The value of determining endpoint temperatures in distinguishing genes with similar phenotypic effects was demonstrated. In a segregating *ha* su_2 population, it was possible to separate each phenotype and, in succeeding generations, each genotype; the correlation between phenotype and genotype did not appear to be strong. Use of certain salt solutions made possible the differentiation of genotypes having equal or almost equal endpoint temperatures. The mean diameter of the starch granules of various endosperm mutants proved to be independent of the endpoint temperature.

2945 Bottazzi, G. B.
Una polentata in Cadore. **(A meal of polenta in the Cadore).**
G. Agric. 1958 : **68** : p. 67.

Maize hybrids of the American type are inferior in quality for the production of polenta. By crossing inbred lines selected from the Italian flint variety Marano Vicentino, however, a double cross has now been obtained which combines the quality of the original variety with the increased yield and other qualities associated with hybrid corn.

2946 Brandolini, A.
Il germoplasma del mais e la sua conservazione. (**Maize germ plasm and its conservation**).
Maydica, Bergamo 1958 : **3** : 4–14.

The remarkable increases in maize yields in Italy in recent years are attributed largely to the use of dent lines from the USA for crossing with the flint types prevalent in Italy; maize growing in parts of East Africa has been saved by the use of lines from the Caribbean islands possessing resistance to *Puccinia polysora*; these two cases are taken as illustrating the need for the preservation of local open-pollinated varieties for the retention of germ plasm in all areas where maize has been cultivated and efforts made in this direction in the USA and in the Mediterranean area are referred to [cf. 4333]. A brief historical account is given of maize growing in Italy; the first introductions were from Haiti, Cuba, Mexico and Guatemala and not climatically adapted; later introductions from the higher altitudes of the Pacific coast were more successful and as a result of the diversity of climatic conditions gave rise to a secondary centre of origin. A collection has been made of 559 local types occurring in different parts of Italy, which are being maintained at the Maize Research Station at Bergamo, where they are being subjected to classification and further study. Some of the types are illustrated.

2947 Murty, G. S. & Roy, N. N.
Study of the Indian collection of maize varieties with special reference to the relationship between yield and other characters.
Indian J. Genet. 1957 : **17** : 73–89.

A review is presented of the literature on correlation studies in maize. Interrelationships between yield and various ear and plant characters were determined from a study of 95 indigenous and exotic varieties. It appeared that plant height, leaf area and length of ear together account for most of the variability in yield; these characters may therefore be used in selecting for high-yielding varieties.

2948 Duncan, W. G.
The relationship between corn population and yield.
Agron. J. 1958 : **50** : 82–84.

"The logarithm of the average yield of individual corn plant making up a population bears a linear relationship to the population. Therefore, only two yield-population values are needed to estimate yields at any other population within the linear range. Equations are given for estimating maximum yield and maximum-yield population".

2949 Makarov, N.
(**A survey of the results of maize growing**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. **1** : 7–9. [Russian].

The top cross Uspeh [Success] (Dnepropetrovsk x the inbred line Gruševskaja 380) is mentioned, along with several other maize hybrids from the Maize Institute. It outyields Dnepropetrovsk by 4–5 c. per ha. and shows resistance to drought.

2950 Wernham, C. C.
Hereditary disease resistance "bonus" from plant breeding.
Sci. Fmr., Pa. 1957 : **5** : No. 2 : p. 11.

Difficulties encountered in incorporating disease resistance into maize hybrids are briefly mentioned in this popular article.

2951 Moll, R. H.
The inheritance of brown spot resistance in corn.
Diss. Abstr. 1957 : **17** : Publ. No. 21,900 : p. 1648. (Abst.)

"The purposes of this study were to gain knowledge about the inheritance of resistance to brown spot [*Physoderma zeae-maydis*,] of corn and to examine the partitioning method of genetic analysis proposed by Powers, Locke and Garrett in 1950.

"The partitioning method of genetic analysis was approached as two distinct procedures. These are (1) the partitioning method using the normal distribution and (2) the partitioning method using the observed distributions. The advantage of the method using the normal distribution is that it permits the testing of genetic models in which the value of each genotype may be specified. The difficulties which were encountered were: (1) no critical test was found which would lead to a unique solution, (2) certain assumptions concerning the normality of the distributions and estimates of the mean and variance may not be valid for data obtained by use of a rating scale such as the one used in this study, and (3) the procedures are cumbersome and time consuming which probably limits the method to characters involving few loci. The method using the observed distributions is at present limited to testing only three hypotheses; viz., that one, two or three loci are segregating for the character in question. The advantage of this procedure is that no assumptions are made about the form of the distributions, and estimates of the mean and variance are not required.

"The results of this study indicate that at least four loci influence the resistance to brown spot in corn, and there is evidence that epistasis is involved. Hypothetical considerations based on the genetic models derived and supported by empirical results suggest rather strongly that the disease reaction of single crosses cannot be predicted from the disease reaction of the inbred lines". [Cf. XXVII, 1322].

2952 NELSON, R. R.
A major gene locus for compatibility in *Cochliobolus heterostrophus*.
Phytopathology 1957 : **47** : 742–43.

Evidence is presented and discussed showing that compatibility in the above pathogen is determined by a single major gene pair. Differences in the degree of intergroup and intragroup fertility among monoconidial isolates indicate that a number of other loci may be involved in control of the sexual process.

2953 **A summary of some aspects of agricultural experimental work, 1956/57.**
Nyasald. Fmr. For. 1957 : **4** : No. 1 : 3–12.

Maize. Some of the single crosses grown at Chitedze for the first time outclassed both Namalenga and Top Cross 26 in yield and agronomic characters. Further work with these crosses is in hand at the Chitala Experiment Station and at Makanga a synthetic variety is being developed which will incorporate resistance to *Puccinia polysora*.

2954 STOREY, H. H. *ET AL.*
East African work on breeding maize resistant to the tropical American rust, *Puccinia polysora*.
Emp. J. exp. Agric. 1958 : **26** : 1–17.

Two races of *P. polysora* are now known in East Africa, EA1, which is widely distributed, and EA2, found in glasshouses at Muguga, Kenya, in 1955 [XXVI, 405]. No resistant material was found among African maize varieties but lines have now been selected from material from Central America and the Caribbean area containing one of two genes, designated *Rpp*1 and *Rpp*2. The former confers high resistance to race EA1 but none to EA2 while the latter confers moderate resistance to both races. No breakdown of resistance with maturity has been confirmed. Progress made so far in incorporating the resistance genes into locally adapted maize lines is reported from Muguga, Kilifi and Kwale, Kenya, Nachingwea, Tanganyika and Kawanda, Uganda. [Cf. XXVII, 2948].

2955 CAMMACK, R. H.
Studies on *Puccinia polysora* Underw. I. The world distribution of forms of *P. polysora*.
Trans. Brit. mycol. Soc. 1958 : **41** : 89–94.

"An examination of herbarium material of *Puccinia polysora* from all areas of the world revealed two main size groups of uredospores. The smaller group was encountered in South East Asia and neighbouring islands with the exception of Borneo, and the larger group in the West Indies, Africa and the South Indian Ocean. The two main groups are consistent with the two directional spread, westwards and eastwards, from the origin of the rust, the Carribbean area.

"As data on cross-inoculation studies are lacking it is uncertain if distinct forms of *P. polysora* exist". [Author's summary.]

2956 JENNINGS, P. R.
A histological study of northern and of southern corn leaf blights.
Diss. Abstr. 1957 : **17** : Publ. No. 22, 261 : p. 1880. (Abst.).

The results of a study of resistant and susceptible inbreds of maize suggested that resistance to *Helminthosporium turcicum* depends upon a property of the xylem; the resistant principle is not however "a function of morphological structure". The chlorenchyma appeared to be the site of the principle conferring resistance to *Cochliobolus heterostrophus*.

BARLEY

2957 Bericht over rassenkeuze. (**Report on choice of varieties**).
Zaadbelangen 1958 : **12** : p. 23.

The results of yield trials of spring barleys on different soil types in the Netherlands in 1946–1957 are summarized.

2958 PETROV, G.
(**Results of the completed experiments with barley at the Dobrudža Institute**).
Naučn. Trud. (Sci. Trans.), Minist. Zemed., Sofija: Ser. Rastenievădstvo (Pl.-growing) : 1957 : **2** : No. 1 : 1–13. [Bulgarian].

Hanna proved the most productive among the brewing barleys and variety 129 among the spring barleys tested. The latter also surpassed other spring varieties in resistance to drought and lodging. The best winter barley was 1241, originating from Čirpan; it combined earliness with high yield, hardiness and resistance to drought and lodging. The next best winter barley was the lodging-resistant variety 1337.

Annual Meeting of the Malting Barley Improvement Association, Milwaukee, Wisconsin. Progress Report 1957 : Pp. 72. (Mimeographed).

2959 *Status of some new barley varieties.* (*pp. 20–23*).

Traill, UM570, Fox, Parkland, Betzes and Haisa II were described as promising in the previous year's report [XXVII, 4020]. Three other varieties are still undergoing evaluation, namely Heines Hanna, introduced from Germany, Forrest and Liberty [XXVII, 4028].

2960 *Progress reports on barley in 8 states.* (*pp. 32–65*).

Extensive trials of named varieties and breeding lines are reported from North Dakota and progeny from Traill x B100 and Traill x UM570 continue to show promise in respect of agronomic characters and malting quality [XXVII, 4019], while five early maturing selections from intercrosses of Kindred x Titan lines were outstanding for yield. Other crosses have been made with a view to incorporating resistance to *Septoria* leaf blotch, spot blotch, net blotch, leaf and stem rust, loose smut or stripe mosaic into lines with acceptable malting and agronomic quality and advanced generations from 21 crosses are undergoing evaluation. Sources of resistance to *Septoria* leaf blotch have been surveyed in cooperation with workers in Minnesota and Manitoba and a number of lines of diverse origin were found to be highly resistant. Detailed quality tests of advanced selections are also briefly reported.

At the University of Minnesota studies have been carried out by G. A. Paterson on the Statistical evaluation of early generation testing in a barley cross using related F_3, F_4 and F_5 lines grown simultaneously [XXVIII, 1656] and A. E. Slinkard on The relationships in two barley crosses between F_2 plants and their progenies grown in hills. The following conclusions were reached in the latter study: (1) selection in the F_3 and F_4 generations can be effectively carried out in hills used as breeding plots; (2) the percentage of plump kernels is the most satisfactory measure of seed size; and (3) in order to obtain large-grained lines, large segregating populations may need to be grown from crosses between small-grained and large-grained lines. From a study of two crosses R. McKenzie has reported that: (1) two years of divergent selection in the F_4 and F_5 generations had little effect on the yield of the F_6 lines, (2) in one cross high and in the other low correlations were observed in respect of yield in related F_3 and F_6 plants and (3) high correlations were found in both crosses for heading date and plant height. B. H. Beard reports progress made in the evaluation of a gamete-selection programme, interspecific hybridization and the production of tetraploid barley. Details are given of crosses under observation in Minnesota. Resistance to spot blotch, yellow dwarf, mildew and *Septoria* has been shown by some selections and segregation in the F_2 of Feebar x Manchuria selections indicates that the parents carry different resistance genes.

Work in progress at Montana State College includes the use of Titan in an extensive backcross programme in which the material is now at all stages from the first to the seventh back cross. A report by E. A. Hockett on Two-row barley improvement is included. Some newer introductions are under test and malting quality evaluation of the world collection is to be made at the Bozeman Laboratory. Among the breeding projects under way are the conversion of six-rowed into two-rowed types, incorporation of stripe mosaic resistance, increase of height and straw strength, development of earlier heading varieties, the production of a hulless variety and diallel crossing among 12 varieties to determine parental prepotency.

Yield trials of varieties and selections are reported from the University of Wisconsin and breeding for resistance to lodging is continuing, using Kindred as the recurrent parent in a backcross programme. Selections from the world barley collection at Beltsville, Maryland, have been tested for lodging resistance and the data concerning 23 of them are tabulated. In addition to the studies mentioned in the previous year's report [XXVII, 4019] a study of the inheritance of height factors is under way.

The work at South Dakota State College includes an extensive crossing programme designed to build up a large number of lines for later selection and greenhouse examination of the world collection of Ethiopian barleys and of Japanese brachytics and semibrachytics. Named varieties and selections are being treated with physical and chemical mutagens.

Recurrent selection has continued at Michigan State University together with studies on the nature of resistance to and pathogenicity of

Ustilago hordei and of the pathogenicity of *Helminthosporium sativum* (*Cochliobolus sativus*). The Iowa State College reports that work described previously [*loc. cit.*] is being continued and provides data on the performance of 10 varieties grown in Iowa between 1953 and 1957.

Tabulated data from the University of Illinois show the yields of 14 spring varieties and 15 winter varieties in 1957 and grain-drying data for 19 varieties.

2961 **Quality evaluation of barley varieties and selections grown in 1956.**
Publ. Malt Res. Inst., Madison 1957 : No. 14 : Pp. 13.

The conclusions drawn from the results reported here are summarized in the form of brief notes on the malting and brewing performance of six six-rowed and four two-rowed varieties in tests carried out on samples from the United States and Canada at the Barley and Malt Laboratory, Madison, Wis.

2962 Mericle, L. W. & Mericle, R. P.
Irradiation of developing plant embryos. I. Effects of external irradiation (X rays) on barley embryogeny, germination, and subsequent seedling development.
Amer. J. Bot. 1957 : **44** : 747–56.

A number of histological and morphological abnormalities have been observed in barley embryos and seedlings after X irradiation with various doses at different stages of development at Michigan State University, East Lansing. Lethal and semilethal conditions, usually affecting all the leaves, were observed in germinating seedlings after irradiation at all stages of development and it is suggested that such abnormalities result from genetic changes.

2963 Ramage, R. T. & Suneson, C. A.
A gene marker for the g chromosome of barley.
Agron. J. 1958 : **50** : p. 114.

A gene (*ec*) conditioning earliness is completely linked with the break point of interchange c1433 (f–g) and closely linked with the break point of interchange c1462 (b–g). The gene was discovered as a simple recessive mutation in the BC_6 of California Mariout x ♂-sterile Club Mariout. When sown in the autumn, the mutant plants flower about four weeks earlier than California Mariout, being shorter than this variety and producing fine stems and relatively few tillers. With summer sowing, the differences between California Mariout and the mutants are much less pronounced, the disparity in flowering date being too small to allow accurate identification.

2964 Bowden, W. M.
Natural and artificial x *Elymordeum* hybrids.
Canad. J. Bot. 1958 : **36** : 101–23.

The following hybrids between *Elymus* and *Hordeum* are described: (1) *Elymordeum dutillyanum* (*E. mollis* ssp. *mollis* x *H. jubatum*); (2) *Elymordeum schaackianum* (*E. hirsutus* x *H. brachyantherum*); (3) *Elymordeum piperi* (*H. jubatum* x *E. triticoides*); (4) *Elymordeum dakotense* (*H. jubatum* x *E. canadensis*); (5) *Elymordeum triploideum* (*H. distichon* x *E. racemosus* var. *racemosus*); (6) *Elymordeum stebbinsianum* (*H. brachyantherum* x *E. glaucus*); (7) *Elymordeum berkeleyanum* (*H. brachyantherum* x *E. condensatus*); and (8) *Elymordeum montanense* (*E. virginicus* x *H. jubatum*). The parental species are known to be tetraploids ($2n = 28$), with the exception of the diploid *H. distichon* and *E. hirsutus* whose chromosome number has not been determined. Hybrid (5) was an artificial combination from Russia. The remaining hybrids were North American in origin, the parentages of the putative natural hybrids having been experimentally confirmed in the case of (6), (7) and (8). All eight hybrids were completely pollen and seed sterile. Detailed cytological data are given for (8). Meiotic irregularities such as a high univalent frequency, bridges, fragments and micronuclei were found; the chromosome number was $2n = 28$.

2965 Ševeluha, V. S.
(Observations on variability of winter barleys in the foot-hill zone of the North Caucasus).
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1957 : **6** : 69–74. [Russian].

When a two-rowed barley of var. *nutans* was grown under the climatic conditions of the North Caucasus it gave rise to a form with hooded spikelets. This form in its turn gave a progeny of two-rowed and six-rowed plants in which the hoods tended to change back into awns. Three distinct types of hooding are described. The extent and type of hooding in the above material were different from the manifestation of these characteristics in sexual hybrids of hooded x awned barleys. The report also mentions changes of var. *pallidum* into vars. *distichum* and *intermedium*. These changes are attributed to external conditions.

2966 Gaul, H.
Die Bestimmung der Frequenz von Punktmutationen bei Pflanzen. (**Determination of the frequency of point mutations in plants**).
Z. Naturf. 1957 : **12b** : 557–59.

The substance of this paper has been summarized from another source [481].

2967 Hagberg, A.
Cytogenetik einiger Gerstenmutanten. (**Cytogenetics of some barley mutants**).
Züchter 1958 : **28** : 32–36.

Cytogenetic studies of *erectoides* mutations are described; most of the work has been mentioned elsewhere [XXVII, 1472 and 1769]. So far 70 *erectoides* mutations have been induced; they are distributed at more than 22 (probably 25) loci. Several mutations have occurred at loci *a*, *c*, *d* and *m*, but most loci have mutated once only. The loci differ in their stability under various treatments and in different genotypic environments. Two loci may mutate at the same time; *ert* 14 involves both the *c* and *d* loci. Some account is presented of investigations giving information on the distribution of *erectoides* loci and translocation points on the chromosomes concerned.

2968 Hörberg, Y.
Weibulls original Ingridkorn. (**The original Weibull barley Ingrid**).
Weibulls Årsb. Växtföräd. Växtodling 1958 : **53** : 25–28.

Data showing the superiority of Ingrid (line 5425) over Rika and Carlsberg II are presented. The variety is to be released in spring 1958. [Cf. 485 and 2639].

2969 Adams, J. D. & Nilan, R. A.
After-effects of ionizing radiation in barley. II. Modification by storage of X-irradiated seeds in different concentrations of oxygen.
Radiation Res. 1958 : **8** : 111–22.

Dormant seeds of Himalaya barley were treated with X rays and stored for two, four, six or eight weeks in nitrogen, air or oxygen. Post-irradiation storage in air resulted in increased frequency of chromosomal aberrations and reduced germination and vigour. These effects were enhanced in oxygen and reduced in nitrogen.

"The increase in chromosomal bridges and fragments is explained in terms of the 'potential or latent break' and the 'differential reunion' hypotheses. These hypotheses also may explain the lack of increase in induced mutation frequencies after irradiation. It is concluded that the ratio of induced mutations to chromosomal aberrations can be strikingly altered by post-irradiation treatments of X-irradiated seeds. "Certain chromosome mutagens produced in the seeds through radiodecomposition of organic compounds may also be responsible for the increased chromosomal aberrations. A probable explanation of the origin of spontaneous cytogenetic changes in aged seeds is presented in the light of this interpretation."

2970 Das, K.
Cytogenetic studies of an X-ray irradiated barley line with two separate translocation rings of four chromosomes.
Indian J. Genet. 1957 : **17** : 103–09.

A partially sterile plant (C1376–1) from X-irradiated seed of the variety Mars was found with two separate translocation rings; one ring was attached to the nucleolus. By crossing a descendant of C1376–1 with a homozygous tester C1385 carrying chromosomes a + b, a ring of six chromosomes was obtained; this indicated that one of the original rings of C1376–1 had either chromosomes a or b [cf. XXV, 1979]. Linkage tests with stocks carrying only the ring attached to the nucleolus showed that partial sterility is associated with the factor pair *Ac ac* in linkage group VI but not with *K k* in linkage group V; it is thought that the ring attached to the nucleolus contains chromosomes c + f.

2971 Lenkov, L. D.
(**Postharvest maturation in barley**).
Naučn. Trud. selskostopan. Akad. Georgi Dimitrov. agronom. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1957 : **4** : 113–19. [Bulgarian].

The periods required for ripening off by two-rowed spring barleys, six-rowed winter barleys and a six-rowed spring variety were determined, varietal differences being noted.

2972 Takahashi, R., Akaki, H. & Inouye [Inoue], T.
Semi-sterility in some two-rowed varieties of barley for malt and the barley stripe mosaic virus as its possible cause.
Ber. Ōhara Inst. 1957 : **11** : 78–91.

It had been thought that semisterility in two-rowed barley varieties grown in Hokkaido might be a maternally-inherited characteristic. Experiments are described here which indicate that a strain of barley stripe-mosaic virus is probably responsible.

2973 Das, K.

Partial sterility in a line of X-ray irradiated barley.

Indian J. Genet. 1957 : **17** : 58–64.

A plant with ovule sterility from an X-irradiated stock of the variety Mars was crossed with a variety carrying normal linkage groups; the F_1 progeny were fertile. In the F_2, normal plants and plants with partial ovule sterility segregated in a ratio of 3 : 1; this indicated that partial sterility was controlled by a single recessive gene. Since the sterility of the F_2 plants was relatively low, sterility may also have been caused by cryptic structural changes in the chromosomes of the irradiated parent. No association between partial sterility and factors in linkage groups I to V was found. In one F_2 family the factor pair *B b* controlling lemma colour segregated in a 9 : 7 ratio instead of the expected 3 : 1 ratio; in another F_2 family the *K k* factors responsible for the hooded character segregated in a similar fashion.

2974 Nuttonson, M. Y.

Barley-climate relationships and the use of phenology in ascertaining the thermal and photo-thermal requirements of barley. Based on data of North America and of some thermally analogous areas of North America in the Soviet Union, Finland, Poland, and Czechoslovakia.

Amer. Inst. Crop Ecol., Wash. 1957 : Pp. 280.

An analysis of extensive phenological data already available from observations on barley varieties at agricultural experiment stations in the above regions has indicated the possibility of employing such data in conjunction with meteorological and day-length records (1) to determine the thermal and photothermal requirements of winter and spring barleys under uncontrolled field conditions, (2) to provide a means for a physiological-thermal classification of varieties and (3) to develop criteria for the prediction of dates of heading and maturity.

2975 Albrechtsen, R. S.

Hood elevation and awn length inheritance studies in barley.

Abstr. Thes. Utah St. Univ. 1957 : **5** : p. 13. (Abst.).

F_2 data from 42 crosses indicated that segregation of two factor pairs, Kk and K_2k_2, was responsible for the inheritance of hoods and awns, the different phenotypes having the following genotypes: sessile hoods, $KK\ K_2K_2$; medium hoods, $Kk\ K_2K_2$; extremely elevated hoods with mixed awns as regards length, $KK\ K_2k_2$ and $Kk\ K_2k_2$; long awns, $KK\ k_2k_2$ and $Kk\ k_2k_2$; and short awns, $kk\ K_2K_2$, $kk\ K_2k_2$ and $kk\ k_2k_2$. Evidence was obtained suggesting linkages between the following pairs of factors: *Trdtrd* and *Bb*; *Zz* and *Kk*; *Glgl* and *Kk*; *Ii* and *Kk*; *Ii* and *Zz*; *Glgl* and *Zz*; *Gsgs* and *Zz*; *Hh* and *Vv*; *Ll* and *Vv*; *Hh* and *Ll*; *Re2re2* and *Vv*; *Blbl* and *Kk*; and *Brbr* and *Kk*.

2976 Day, A. D.

Yield and quality of spring malting barley varieties grown as winter annuals under irrigation.

Agron. J. 1958 : **50** : 68–71.

With Arivat as the control, twenty varieties were grown as a winter crop under irrigation at Mesa, Ariz., during 1954–56. Compared with the Manchuria group of varieties, the Coast group was higher in yield, weight per 1000 grains and resistance to lodging and shattering but lower in bushel weight, barley and malt N, barley and malt diastatic power, and barley and malt extract. Compared with six-rowed varieties from the midwest of the USA, two-rowed varieties from the western region were higher in bushel weight, 1000-grain weight and barley and malt extract but lower in barley and malt protein and diastatic power. None of the varieties combined high yield with a good standard in all malting properties.

2977 Munekata, H. & Katô, S.

Varietal difference in chemical properties of brewing barley. II. Studies on distributions of diastatic and proteolytic activities in barley varieties.

Bull. Brew. Sci., Tokyo 1957 : **3** : 11–22.

Information is provided on the diastatic and proteolytic activities of an extensive series of Japanese, Manchurian, Soviet, European and American barleys. There was a tendency for enzyme activity to be lower in European and American varieties and to increase with number of spikelet rows. [Cf. XXVI, 3326].

2978 Munekata, H., Yanagawa, F. & Yoshimura, H.

Varietal difference in chemical properties of brewing barley. III. Studies on the enzymic specificities, nitrogen content and water sensitivity of barley varieties.

Bull. Brew. Sci., Tokyo 1957 : **3** : 23–38.

The α-amylase, β-amylase, protease and cytase activities of a series of Japanese and introduced barleys were determined. Three varietal groups could be differentiated: A, low β-amylase and a high ratio of protease + cytase/α-amylase; B, high β-amylase and a low ratio of cytase/α-amylase; and C, intermediate β-amylase. Groups B and C are further subdivided. Correlation coefficients between nitrogen content, on the one hand, and α-amylase, β-amylase and protease, on the other, were +0·715, +0·732 and +0·237, respectively. Some correlation was noted between water sensitivity of the grain during germination and enzyme activity.

2979 WIEBE, G. A. & REID, D. A.
Comparative winter hardiness of barley varieties.
Tech. Bull. US Dep. Agric. 1958 : No. 1176 : Pp. 20.

Out of 204 varieties tested at a number of localities in the United States and Canada during the period 1937–56, Kearney had the highest percentage survival, closely followed by Dicktoo. Details of the performance of the varieties included are presented in table form.

2980 UDVAROS, K.
Az őszi árpa télállóságáról. (**On hardiness in winter barley**).
Agrártudomány 1957 : **9** : No. 9 : 8–10.

At the Borsós State Farm, Hungary, comparisons of the behaviour of 1245 lines from F_4 populations of spring x winter and winter x spring barleys after autumn sowing and after spring sowing showed that although good winter hardiness is generally accompanied by higher vernalization requirements, the reverse is not true.

2981 DENTLER, J.
Untersuchungen über die Anfälligkeit von Sommergerstensorten gegenüber Mehltau. (*Erysiphe graminis hordei* DC.) [**Investigations on the susceptibility of spring barley varieties to mildew. (*E. graminis hordei* DC.)**].
Z. Acker- u. PflBau. 1958 : **105** : 89–107.

In addition to describing the effect of various temperatures and potassium and nitrogen fertilizers on the susceptibility of some spring barleys to attack by powdery mildew, observations on the reaction of resistant varieties to the fungus are recorded. Firlbeck 111 and Lichtis Astra are hypersensitive and cells penetrated by the hyphae immediately die; in the partially resistant variety Hord. tetrx. T4, this reaction sets in more slowly.

2982 GORTER, G. J. M. A.
A new physiologic race of *Erysiphe graminis hordei* Marchal.
S. Afr. J. Sci. 1957 : **53** : 443–45.

A race (SA1) of barley mildew found in the Transvaal is closely related to the North American races 8 and 14, as indicated by the differential reactions of the barleys Nepal, Peruvian, Black Hulless, Heils Hanna 3 and Chevron. It differs however from these races in the reactions it incites in Batna and Roho. SA1 is therefore distinct from the races so far described as occurring in other countries. A change in the analytical key for the differentiation of races is proposed in order to put less emphasis on Black Hulless, which is considered to be unsatisfactory as a differential since it gives dissimilar reactions at high and low temperatures and is inclined to show intermediate responses. It is suggested that Batna would be a suitable substitute for Black Hulless and that racial identification should be based mainly on the reactions of Goldfoil, Heils Hanna 3 and Chevron.

2983 MODE, C. J. & SCHALLER, C. W.
Two additional factors for host resistance to net blotch in barley.
Agron. J. 1958 : **50** : 15–18.

Inheritance of resistance to net blotch (*Pyrenophora teres*) was investigated in crosses involving the susceptible varieties Atlas and Atlas 46 and the resistant Canadian Lake Shore, Tifang, Ming, Harbin, Manchurian and CI4922. All the resistant parents are Manchurian in origin. Three dominant genes for resistance, Pt_1, Pt_2 and Pt_3, were found. Pt_1 and Pt_2 were closely linked with a recombination value of 2·57%. Tifang contained Pt_1Pt_1, and Ming, Manchurian and Harbin, Pt_2Pt_2. Canadian Lake Shore and CI4922 had both Pt_2 and Pt_3 in the dominant homozygous condition. All the resistant varieties were otherwise homozygous recessives for the *Pt* loci. The gene for powdery-mildew resistance in Atlas 46, derived from Hanna, was inherited independently of the genes for net-blotch resistance. The above three-loci hypothesis does not represent the only possible explanation of the data and should therefore be considered only as a working model.

2984 EL-HELALY, A. F. [AL HILALI, 'A.], IBRAHIM, I. A. [IBRAHIM, I. 'A.] & ABO-EL-DAHAB [ABU AL DAHAB], M. K.
Studies on barley stripe and net-blotch diseases in Egypt.
Alexandria J. agric. Res. 1956 : **4** : No. 1 : 71–90.

This investigation included a field trial to study the relative susceptibility of 10 varieties to both *Helminthosporium gramineum* and *H.* (*Pyrenophora*) *teres.* The most resistant variety to each was Nabawi. The Egyptian isolates of both pathogens appeared to pertain to races unrecognized elsewhere.

2985 YAMADA, W. &. SHIOMI, T.
(**Studies on *Rhynchosporium secalis* attacking barley. I. On the characteristics of the disease, the fungal pathogen, and the relation between variety and infection).**
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. exp. Sta. 1954 : No. 50 : 211–32. [Japanese].

In the course of this study, some 300 hulled and naked varieties grown in Japan were inoculated with the pathogen. The most resistant forms were Coast and Brome, introduced from the USA.

MILLETS AND SORGHUMS

2986 GRICENKO, R. I.
(***Setaria* from northwestern China**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1957 : No. 12 : p. 36. [Russian].

Forms of *Setaria viridis* from Inner Mongolia were among the introduced material tested at the Institute of Plant Industry, Leningrad. They are characterized by short straw, large grain, drought resistance and a growth period which is short even in long days.

2987 BONO, M., DURAND, Y. & MOUSSEAU, J.
Contribution à l'étude des populations sélectionnées de mil (*Pennisetum typhoides*). [**A contribution to the study of selected populations of millet (*P. typhoides*)**].
Bull. agron. Fr. d'out. mer 1955 : No. 15 : 49–57.

Associations between many agronomic and morphological characters were determined in four populations of *P. typhoides* grown in Senegal.

2988 MUNSHI, Z. A. & NATALI, A. H.
Inheritance of leaf mid-rib colour, glume length and grain shape in *Andropogon sorghum* (jowar).
Pakist. J. sci. Res. 1957 : **9** : 94–99.

The inheritance of the above three characters, in a cross between Vani and Saorokartuho, was found at Sakrand, Pakistan, to be governed by a single gene pair in each case. The alleles are designated *Wmd*, white leaf midrib, *wmd* green midrib, *Sgl*, short glume, *sgl*, long glume, *Dp*, round grains, and *dp*, dimpled grains. The first two pairs of alleles were found to be linked, with a 12% cross-over value, but the third pair showed no linkage with the other two.

2989 ARGIKAR, G. P. & CHAVAN, V. M.
A study of heterosis in sorghum.
Indian J. Genet. 1957 : **17** : 65–72.

After a review of work done on hybrid sorghum, the results are reported of trials of 11 F_1 hybrids produced in Bombay State. Hybrid vigour was observed in respect of a number of morphological characters. With one exception, the hybrids outyielded their parents; this was mainly due to an increase in the number of seed per panicle. The yield from Maldandi 35-1 x Viramgam was 201·13% in excess of that of the higher-yielding parent.

2990 ATKINSON, G. F., FRANZKE, C. J. & ROSS, J. G.
Differential reaction of two varieties of sorghum to colchicine treatment.
J. Hered. 1957 : **84** : 259–64.

The coleoptiles of 60 seedlings of each of the varieties Experimental 3 and Norghum were treated with colchicine immediately after germination. Observations were made on treated and untreated plants and their selfed progenies with respect to height, tiller number, presence or absence of awns and aberrant characters. Twenty-four of the 43 surviving C_0 plants of Experimental 3 and four of the 54 surviving C_0 plants of Norghum had undergone mutation. Eighteen variants of the former variety were true breeding for all changed characteristics. Investigation of meiosis of 30 treated individuals of each variety revealed the occurrence of three tetraploids in Norghum; plants of Experimental 3 were without exception diploid. The two varieties showed no differences in frequency of reductional groupings of the chromosomes when root tips of germinating seedlings were treated with 0·5% colchicine.

2991 MELCHERS, L. E.
Sorghum kernel smut infection in relation to temperature.
Trans. Kans. Acad. Sci. 1956 : **59** : 485–91.

Experiments on the soil temperatures required for satisfactory infection with *Sphacelotheca sorghi* in the greenhouse were undertaken with a view to improving the technique of testing varieties and hybrid progenies of sorghum. A mean minimum soil temperature of 55–65° F., or mean minimum air temperature of 58–68° F., for 8–10 hr. daily proved to be desirable for 5–7 days after sowing. These temperatures may be obtained during the night by regulated ventilation. The day air temperatures for the same 5–7 days should be higher and may be allowed to fluctuate and reach 90° F. without prevention of infection. After one week, the plants should be grown at 75–85° F. until the heading stage.

2992 DOGGETT, H.
The breeding of Sorghum in East Africa. II. The breeding of weevil-resistant varieties.
Emp. J. exp. Agric. 1958 : **26** : No. 101 : 37–46.

Following the observation previously reported [XXVII, 3000] of an association between weevil damage in storage and the thickness of the corneous outer layer of the endosperm, crosses have been made at Ukiriguru, Tanganyika, between short-season lines with mealy endosperm and long-season lines with corneous endosperm, with the object of developing short-season, weevil-resistant varieties. Greatest progress so far has been made with crosses between BC27, a mealy variety from the Belgian Congo, and the native resistant variety Wiru. Intensive selection in the F_2 and later generations has yielded a strain designated SUK I, which matures in three and a half months and grows to four or five feet in height. The grain is white with a thick corneous shell but the panicles are rather small and the variety shows serious susceptibility to grain smut although remaining relatively free from leaf diseases. Two lines have been selected from BC27 x Wiru back crossed to BC27, both with larger panicles than SUK I. One designated 36D is vigorous, producing large grain with the corneous material principally in the upper part of the endosperm while the other, 42B, has a more even corneous shell. These three new lines were compared with their parents and Oklahoma 44/14 and in several types of test Wiru, SUK I and 42B were found to suffer considerably less weevil damage than the other lines. Further selection and breeding is in progress.

RICE

2993 PHILLIPS, R. W.
International cooperation to improve rice production and processing.
News Lett. FAO Internat. Rice Comm. 1957 : **6** : No. 4 : 1–15.

A general outline is given of the activities of the FAO International Rice Commission since its establishment in 1949. The activities surveyed include breeding. Proposals are made concerning the future organization and work of the commission.

2994 OYANGUREN, J. DE
Los resultados de los trabajos efectuados por la Estación Arrocera de Sueca en el año 1955. (**Results of work carried out at the Rice Station at Sueca in 1955**).
An. Inst. nac. Invest. agron., Madr. 1957 : **6** : 71–223.

Details are given of the vegetative development, tillering and panicle form of F_2 hybrids of Balilla x Nano [Dwarf], Balilla x (Colusa x Nano), (Colusa x Nano) x Nano, (Balilla x Bomba) x Balilla, and [(Balilla x Bombilla) x Balilla] x Balilla.

Observations were made on a large number of varieties, introduced and local, on selections from them and on bulk progenies of the cross Balilla x Nano.

The F_1 of Balilla x Alberique contained some plants which flowered up to 20 days later than the former parent and 10 days after the latter; the F_1 of Taichú 65* x Balilla flowered at the same time as Balilla, the earlier parent. The flowering time of many of the F_2 generations was very prolonged, that of Precoz núm. 6 [Early 6] x Balilla extending over 85 days and that of (Balilla x Tremesino) x Balilla over 88 days. Most F_3 generations have a more uniform flowering period and later generations were more uniform still. Heterosis for grain weight was observed in some crosses. The variety Balilla, which under Spanish conditions gives the highest yields, is short and strong in the straw and suitably early, has been crossed with Nira, which has grains 9·8 mm. in length, and Kinanda, which has grains 3·9 mm. in breadth, both of these cultivars having also smooth glumes. Other crosses have been made involving varieties such as Tremesino, Novelli gigante [Giant Novelli] and Insen, with long grains, and Sollana and Americano 1000 with broad grains.

In an extensive study of the question of grain quality in rice it is pointed out that different countries have different criteria for assessing quality.

2995 HWANG [HUANG], C.-W.
(**Regional trials of Peng-lai rice**).
Nung-yeh Yen-chiu/Agric. Res., Taipei 1955 : **5** : No. 3–4 : 46–49. [Chinese].

Trials of 12 Peng-lai (= Horai) varieties at 10 localities in Taiwan during 1950–1 are reported. Data are provided on vegetative period, panicle number, disease and pest resistance and yield.

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* Presumably = Taichung 65 from Taiwan.

2996 ALIM, A.
Rice research in East Pakistan.
Agriculture, Pakistan 1957 : **8** : No. 1 : 29–33.

Work in progress includes the maintenance of pure lines, selection within pure lines, the development of high-yielding, disease resistant hybrids and trials of introduced varieties. A list is included of 31 outstanding strains of various types recommended for East Pakistan.

2997 **Annual Report of the West African Rice Research Station, 1956** (1958) : Pp. 38.

The programme of introduction and testing of varieties was expanded. Selections of local and introduced rices are at various stages. The general procedure to be used for hybrid material is as follows: (1) no selection in the F_1, (2) mass selection from bulk sowings in the next one or two generations and (3) subsequent selection of individual plants grown in pedigree lines. Four new crosses between local and introduced varieties were effected: Bolo 108 x Ngasein 57, Toma 112 x Indo-China 53, India pa lil 46 x Elon Elon and India pa lil 46 x Mayang Ebos 80. The cross between the floating deep-water varieties Indo-China 53 and Indo-China 24, made with the aim of combining the resistance to wash of the former with the reputedly higher yield of the latter, reached the F_3. Hybrids selected in the F_5 comprised Yenti x DC39/15, Ngasein 57 x Tai Chu 65,* Toma 112 x Ngasein 57 and India pa lil 46 x Kav. 12 [cf. 535]. Observations made in connexion with the technique of hybridization were not indicative of any correlations between time of flowering and meteorological data.

Using the Minghetti sampling mill, a standardized procedure has been developed. A 50 gm. sample with 11–12% moisture content is milled for 4 min. at the appropriate setting of the cone in respect to grain breadth.

Other investigations in progress are concerned with (1) the effects of light intensity and temperature on the duration of different varieties, (2) factors influencing dormancy and viability, in connexion with procedures of seed storage in breeding, and (3) development of a technique of initial screening of varieties for salt tolerance in nutrient solutions.

2998 GHOSE, R. L. M., BUTANY, W. T. & SEETHARAMAN, R.
Inheritance of ligule, auricle and junctura in rice (*Oryza sativa* L).
Indian J. Genet. 1957 : **17** : 96–101.

Shala, a variety lacking auricle, ligule and junctura, was crossed with Salak, a variety possessing these organs. From a study of the F_1 and F_2 progeny, it was found that the occurrence of each of these characters is controlled by one of three sets of four duplicate genes; one or more of the dominant genes from the appropriate set can produce the organ concerned. The genes for ligule have an additive effect on the length of this organ but the genes for auricle are not additive. A small but significant correlation was found between ligule and auricle size. Close linkage was found between these three sets of genes; the occasional occurrence of liguleless or auricleless plants in otherwise normal varieties is thought to be caused by spontaneous gene mutation.

2999 **World catalogue of genetic stocks. Rice.**
FAO UN, Rome 1957 : Suppl. No. 6 : Pp. 13.

This issue contains information on additional stocks submitted by breeders in Egypt, Italy, Japan, Taiwan and the USA and also revised data on the blast resistance of Malayan stocks [cf. XXVI, 1317].

3000 BOLLICH, C. N.
Inheritance of several economic quantitative characters in rice.
Diss. Abstr. 1957 : **17** : Publ. No. 21,983 : p. 1638. (Abst.).

Inheritance of spikelet length, spikelet breadth, date of heading and grain yield was investigated in a cross between a commercial variety and an advanced selection. All four characters behaved in a quantitative manner; date of heading was also qualitatively inherited. The parental difference of 0·6 mm. in spikelet length appeared to be governed by at least two and probably three or more factors. Transgressive segregation for both long and short spikelets occurred. The heritability estimate based on F_2 data was 86% while that based on the regression of F_3 lines on F_2 values was 67%. The correlation coefficient between the F_2 and F_3 was 0·72. Partial dominance of narrow over broad spikelet was detected; the parental difference of 0·49–0·75 mm. appeared to be controlled by more than three but probably not more than four or five pairs of genes. The heritability estimates based on F_2 data and the regression coefficient were respectively 58% and 64%. The correlation coefficient between the F_2 and F_3 was 0·71. Earliness showed a high degree of partial dominance over lateness. The parental difference of 43 days was apparently controlled by one pair of major genes and modifiers. Heritability of date of heading, as measured by regression of F_4 on F_3 lines, was 63%. Estimated on the same basis, date of last heading had a heritability of 82%. The correlation coefficient between F_2 and F_3 lines with respect to date of heading was 88%. Transgressive segregation for high yield occurred, 20% of the F_4 lines giving significantly higher yields than the more productive parent. Yield and date of heading were closely associated ($r = -0{\cdot}61$), all late lines being low in yield, in contrast to the early lines which were in most cases high in yield. The evidence suggested that genes for high yielding ability were not expressed when combined with genes for late heading. Yield was very low in heritability, even when selection was carried out on F_3 lines.

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* Presumably = the Taiwan variety Taichung 65.

3001 GANGULEE, H. C.
Rice anthocyanin genetics. II. Some experimental results.
Bull. bot. Soc. Beng. 1955 : **9** : 121–26.

Studies of the progeny of two crosses, Asahi [Rising Sun] x CI5399 and Z-N x Nira, made at Fayetteville, Arkansas, led to the following conclusions. In the case of the first cross previous results [XXII, 1943] were confirmed but with some indication that the dominance of coloured hulls, glumes, stigma and apiculus, determined by the complementary genes *C*, *Sp* and *Rp*, was not complete. In the case of the second cross anomalous results were obtained, a larger number of colourless plants occurring than was expected. Two explanations are suggested, (1) that a basic gene, *C*, is responsible for controlling stigma and apiculus colour but is inhibited by a further gene, *I*, suppressing stigma colour when present as a single dose and both stigma and apiculus colour in the double dose and (2) that *C* and *Sp* both have only a partial effect in the single dose and must both be present in the double dose to cause full coloration of the stigma and apiculus. [Cf. XXV, 3361 and 3363].

3002 ALIM, A. & SEN, J. L.
Stable hybrid vigour as observed in a boro (spring paddy) cross.
Pakist. J. sci. Res. 1957 : **9** : 100–02.

All but one of 14 families from the cross BC22–10-2 x B111–17 significantly outyielded B111–17 at the Deep Water Paddy Research Station, Habiganj (Sylhet).

3003 MORINAGA, T. &. KURIYAMA, H.
Cytogenetical studies on *Oryza sativa* L. IX. The F_1 hybrid of *O. sativa* L. and *O. glaberrima* Steud.
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 57–65.

Information is provided on the inheritance of numerous plant characters in the F_1 of interspecific hybrids between 4 varieties of *O. glaberrima*, on the one hand, and 17 varieties of *O. sativa*, on the other. Meiosis in the F_1 is regular but subsequent abortion of the microspores results in a high degree of sterility. [Cf. XXVII, 3012].

3004 WANG, M.-K. & YANG, S.-C.
(The breeding of Chia-nung-yu 242, a new sort of Peng-lai rice).
Nung-yeh Yen-chiu/Agric. Res., Taipei 1957 : **7** : 25–34. [Chinese].

Chia-nung-yu 242 [Chiayi Agricultural Research Station 242] is a high-yielding, blast-resistant variety of the Peng-lai (= Horai) type. It outyields Tai-chung 65 but is about 5 days later. Its ancestry is Chia-nung-yu 65 x Chia-nung-yu 123.

3005 AZIZ, M. A. & SHAFI, M.
Rice cultivation in the central districts of west Pakistan.
Agriculture, Pakistan 1957 : **8** : 371–81.

The main characteristics of seven varieties recommended for general use in West Pakistan are presented in table form.

3006 KRISHNA, S.
Study of meiosis and pollen development in a wild variety of rice in Hyderabad-Dn.
Agric. Coll. J. Osmania Univ. 1957 : **3** : 34–36.

Observations on microsporogenesis in *Oryza sativa* var. *fatua* ($2n = 24$) are recorded.

3007 NODA, A. & HAYASHI, J.
(Studies on the coleorhiza of cereals. III. On the coleorhiza in the germinating rice seed).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : 24–26. [Japanese].

This morphological and physiological study of the rice coleorhiza includes comparative diagrams of coleorhiza configuration in 15 varieties.

3008 CAPOT, J.

Derniers progrès de la sélection du riz à Yangambi. (**Latest progress in breeding rice at Yangambi**).

Bull. INÉAC 1957 : **6** : 341–49.

Data are provided on the yielding capacity and technological and culinary qualities of the grain of ten promising lines recently bred at Yangambi; R20 gives the highest yield and R67 and R66 have the most translucent grain.

3009 LITTLE, R. R., HILDER, G. B. & DAWSON, E. H.

Differential effect of dilute alkali on 25 varieties of milled white rice.

Cereal Chem. 1958 : **35** : 111–26.

The dispersal of material from milled kernels upon treatment for 23 hr. with 1·7% potassium hydroxide was evaluated for spreading and clearing, using 7-point rating scales. Reaction to the treatment proved to be largely a varietal characteristic. Values for spreading and clearing were negatively correlated with panel scores for cohesiveness at the 1% level of significance with coefficients of —0·51 and —0·85 respectively.

3010 (**Catalogue of the world collection of rice varieties maintained at the Taiwan Agricultural Research Institute**).

Nung-yeh Yen-chui/Agric. Res., Taipei 1954 : **5** : 101–65. [Chinese].

A list of the varieties in the world collection of the Taiwan Agricultural Research Institute is presented with indications as to their provenance.

3011 VARENICA, E. T.

(**The cultivation of upland rice in China**).

Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. **5** : 70–73. [Russian].

Descriptions are given of Kuang-tou [Awnless], Pai-mang [White-awned], Hung-mang [Red-awned] and Chin-yang 13 [Golden 13], which have been introduced from north-eastern China. Kuang-tou, which appears to be a collective name for several awnless land varieties, is the best among them. It has high-quality grain of a flavour almost equal to that of rices grown under irrigation, shows resistance to drought and *Piricularia* and does not lodge or shed grain. It regularly produces high yields. An editorial footnote refers to unsuccessful trials of these varieties in the provinces of Voronež and Rostov, where they failed to ripen in most years before the onset of cold weather. It is added that hybrid forms, said to ripen 20 days earlier, have been bred from this material at Azov.

3012 YATUYANAGI [YATSUYANAGI], S., TAKAHASI [TAKAHASHI], K., MURAKAMI, T. & SAKAI, H.

(**Analysis of the mechanism of ripening of rice at low temperature**).

Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : 8–10. [Japanese].

Four varieties differing in degree of resistance to the adverse effects of cold irrigation water were used. They were ripened at 15° C. and subjected to removal of the leaves at various stages after heading. No correlation was detected between resistance to cold irrigation water and ability to ripen at low temperature. The latter capacity, however, was correlated with grain weight. The varieties differed in the extent to which grain ripening at low temperature depended on the transfer of material from the leaves.

3013 BALDACCI, E. & CORBETTA, G.

La selezione di linee e varietà di riso resistenti alle malattie crittogamiche. (**The selection of lines and varieties of rice resistant to cryptogamic diseases**).

Riso, Milano 1957 : **6** : No. **11** : 13–14.

Screening techniques carried out by the Experimental Station for Rice-growing at Vercelli against several fungal pathogens are briefly described.

3014 CHATTOPADHYAY, S. B. & CHAKRABARTI, N. K.

Relationship between anatomical characters of leaf and resistance to infection of *Helminthosporium oryzae* in paddy.

Indian Phytopath. 1957 : **10** : 130–32.

Varieties having thinner epidermal cells or fewer silicious epidermal bulliform cells were found to be more liable to infection by *H. oryzae* (*Cochliobolus miyabeanus*) at the State Agricultural Research Institute, W. Bengal.

3015 MERNY, G.

Maladies des plantes cultivées à la station de recherches de la CGOT a Séfa en Casamance (Septembre–Octobre 1956). (**Disease of plants cultivated at the research station of the General Company of Tropical Oil Products at Séfa in Casamance, September-October 1956**).

Agron. trop., Nogent 1957 : **12** : 725–34.

Varietal differences in resistance to *Helminthosporium oryzae* (*Cochliobolus miyabeanus*), *Piricularia oryzae* and an unknown parasite causing withering of the leaf tips of rice are reported from the above station in French West Africa. Bluebonnet 50 was one of the least susceptible varieties with respect to all three parasites.

3016 Gallardo, R. C.
Resistance of lowland rice varieties to rice blast.
Philipp. Agric. 1957 : **41** : 223–30.

Twenty-one varieties were tested for resistance to *Piricularia oryzae* under greenhouse conditions at the Central Experiment Station, Philippines. Inomay, Malaman and Ac440 Dr. 260 showed very slight infection when inoculated at the seedling, tillering or boot stage, and may prove useful in breeding for resistance. Intan, Baiang, Apostol, Paimat, Milfor 6(2), Tjereh Mas, Mas Java, Ac224 C–24 and Masa also showed some resistance.

3017 Atkins, J. G. & Adair, C. R.
Recent discovery of hoja blanca, a new rice disease in Florida, and varietal resistance tests in Cuba and Venezuela.
Plant Dis. Reptr. 1957 : **41** : 911–15.

In trials of 2200 rice varieties from over 30 countries for sources of resistance to the above disease, thought to be caused by an insect-transmitted virus, the following varieties and crosses were found to be resistant: Colusa, Asahi [Rising Sun], Lacrosse, Missouri R–500, Lacrosse x Magnolia, Bruin Sel. x Zenith, Hgb. Mix. 11–49–19–5 and B53–2604. [Cf. 1721].

3018 **The spread of white leaf of rice.**
Plant Prot. Bull. 1957 : **6** : 30–31.

In Florida, it was observed that short-grain rice varieties are more resistant than long-grain types to the white-leaf virus.

FORAGE GRASSES

3019 Memoria de los trabajos realizados durante la campaña 1955–56. **(Report on work carried out in the season 1955-56).**
An. Inst. nac. Invest. agron., Madr. 1957 : **6** : 227–98.

The results of trials in different parts of Spain with a large number of species and varieties of forage plants are presented.

3020 Tätigkeitsbericht für das Jahr 1957. **(Report of activity for the year 1957).**
Mitt. Arbeitsgemein. Förder. Futterbau. 1957 : No. 53 : Pp. 44.

Notes are provided on the performance of some English varieties of cocksfoot, ryegrass and red and white clover grown as mixed crops at Zürich.

3021 Bereznjakovskaja, A.
(The study of a collection of forage plants in Kara-Kalpakia).
Hlopkovodstvo (Cott.-raising). 1958 : No. 1 : 36–37. [Russian].

With a yield of 329 c. per ha. in three cuts, Sudan grass outyielded all other wild and cultivated forage plants tested on saline soil in Uzbekistan. Sweet clover was the most productive among the legumes and yielded more than twice the amount of forage of lucerne. The highest yielding strains of lucerne were midseason types originating from Central Asia, but an early form from France, and another from Italy, were also productive and are regarded as valuable in breeding for earliness.

3022 **Report of Western Forage Crops Conference. Eighth Meeting held at Agassiz, B.C., June 21st and 22nd, 1957.** Pp. 83. (Mimeographed).

In addition to the contributions abstracted below, the proceedings of the Subcommittee on Plant Breeding and Varietal Testing included the following items on forage-crop improvement in western Canada: a table giving the 1957 ranking of cocksfoot strains and varieties for winter hardiness; Release of breeding stock, D. H. Heinrichs; Licensing of new varieties of forage species, T. M. Stevenson; Regional testing of potential parent lines, E. D. Putt; and Increase of breeding stock, W. J. White. Among the topics discussed by the Subcommittee on Management was Winter killing in alfalfa; varietal differences in this respect were referred to by most of the participants.

Objectives in forage crops breeding in western Canada. (pp. 5–22a).

3023 *Bolton, J. L. Alfalfa. (p. 5).*

A cooperative project at the Swift Current Experimental Farm, Sask., has as its objective the development of a creeping-rooted variety with quick recovery and a high degree of resistance to bacterial wilt. Wilt-resistant synthetics bred at the Forage Crop Laboratory, Saskatoon, are to undergo regional tests in Canada and the USA in 1958. They are expected to equal or surpass Grimm and Ladak in hardiness, seed and forage yield and recovery after cutting. The Plant Pathology Laboratory at Saskatoon is cooperating with other units in screening for resistance to stem and leaf diseases, to obtain material for use in breeding. Some progress has been made at Edmonton, Alba., in selection of resistance to winter crown rot.

3024 *Knowles, R. P. Bromegrass. (pp. 5–5a).* Breeding is centred at Saskatoon, where the objectives are (1) higher forage and seed yields in the northern type, (2) production of a reduced creeping variety of the northern type with better seed yield than Parkland and (3) selection in the southern type for improved seed yield. Leafiness and resistance to lodging are considered in selection. When natural epidemics occur, screening for resistance to leaf diseases is also carried out. Three strains representing these three objectives are in the second generation of synthesis and under test at several experimental farms. Cytological work and breeding have also been initiated at the University of Manitoba, with emphasis on the southern type, which is better adapted than the northern in southern Manitoba.

3025 *Greenshields, J. E. R. Sweet clover. (p. 5a).*
The main requirements are: a vigorous leafy variety free from coumarin and suitable for hay, pasture and silage; good production of green manure, particularly in the second year of growth; and satisfactory seed-production potential in all varieties. Preliminary observations on a coumarin-free synthetic developed at Saskatoon suggest that it will be at least equal to Arctic. First-year data from three localities indicate that Erector is superior to other sweet clovers and crops for green manure. Some progress has been made in developing a coumarin-deficient variety of *Melilotus officinalis* similar to Erector. Evidence has been obtained that coumarin deficiency and permeable seed are lethal when occurring together.

3026 *Downey, R. K. Orchard grass. (p. 6).* At Lethbridge, Alba., the chief aim is the development of winter-hardy, high-yielding strains well-adapted to local conditions. A secondary objective is the production of strains combining winter hardiness with later heading, greater leafiness and sustained production in mid and late summer. Later heading will have the advantage of providing better pasture over a longer season while hay from cocksfoot-legume mixtures will be of better quality if heading and flowering coincide more closely. Two four-clone and two mass synthetics are at present under test throughout Canada. Data so far collected show that these strains are the most winter-hardy available. Selection for hardiness has however resulted in an accompanying increase in earliness of heading and a tendency to dormancy during mid and late summer. At Agassiz, BC, the development of a leafy, high-yielding, late-heading variety of suitable maturity for use in hay mixtures with red clover is receiving attention. Secondary aims are persistence, winter hardiness and resistance to purple spot, brown stripe, stem rust and powdery mildew. To date strains have been produced which combine late heading, a yielding capacity comparable with that of commercial varieties and improved winter hardiness.

3027 *Greenshields, J. E. R. Red clover. (pp. 6–6a).*
The Lacombe Farm and the Plant Pathology Laboratory at Edmonton have cooperated in breeding for resistance to northern anthracnose (*Kabatiella caulivora*) and powdery mildew (*Erysiphe polygoni*). A synthetic composed of six selections of Dollard which have shown a high degree of resistance to both these diseases, and two synthetics derived from the most disease-resistant selections of Siberian, were made up from polycross seed obtained in 1955. The Dollard synthetic is marked by the absence of the characteristic crescent from the leaves. It is hoped that sufficient seed of the synthetics will be available for extensive testing in 1958. In northern Saskatchewan, one of the main problems is winter killing, largely due to winter crown rot. Strains are first selected for hardiness, seed set and other agronomic characters at Melfort and Saskatoon; selections are then tested for crown-rot resistance at the Plant Pathology Laboratory, Edmonton.

3028 *Knowles, R. P. Crested wheatgrass. (pp. 6a–7).*
Breeding, centred at Saskatoon, has the objectives of the production of (1) a variety of the Standard type (*Agropyron desertorum*) improved in forage and seed yield and leafiness; (2) a Fairway strain (*A. cristatum*) with taller and more erect growth; (3) a tetraploid of the Fairway type by colchicine treatment and hybrids with Standard; and (4) hybrids between *Elymus junceus* and *A. intermedium*. Fourteen synthetics have been produced on the basis of progeny testing of selections of the Fairway and Standard types. Although an improvement in height and leafiness has been attained, forage yields in the Syn–2 have not exceeded 5% superiority over those of the controls. In the Syn–2 and Syn–3 marked decline in seed setting has occurred. Polycrosses have recently been established for reevaluating selected plants. Progeny tests are being carried out on a more

elaborate scale than formerly and a wide synthetic base is being employed to minimize inbreeding.

3029 *Heinrichs, D. H. Intermediate wheatgrass.* (*p.* 7).
Hardiness, drought resistance, seed yield and resistance to crown rot are among the characters in which improvements are being sought at Saskatoon and Swift Current. Considerable differences exist in degree of creeping rootedness, the more bunch-rooted types probably being desirable. The variability found in aphid resistance suggests scope for selection.

Report on the Thirteenth Southern Pasture and Forage Crop Improvement Conference, Georgia Experiment Station, Georgia, May 15-17, 1956 : Pp. 61. (Mimeographed).

3030 *Osborne, T. S. A radiation service for southern plant breeders.* (*pp.* 15–17).
A discussion of the possible uses of radiation in crop breeding and of some difficulties of the method is followed by information on the facilities and service provided by the University of Tennessee, under contract with the US Atomic Energy Commission, for treating breeders' material.

3031 *Burton, G. W. Where do we stand on breeding for improved quality?* (*pp.* 17–20).
The investigations referred to and the opinions expressed include the following. E. D. Donnelly and G. E. Hawkins reported that stem type and tannin content affect palatability in *Lespedeza cuneata*, as indicated by work at the Agricultural Experiment Station of the Alabama Polytechnic Institute. Highly uniform fine-stemmed inbreds with good agronomic characters have been developed. Low-tannin lines have also been produced but they lack the desired agronomic properties. Experimental synthetics and hybrids have been developed from a number of the fine-stemmed inbreds, which are also undergoing increase for possible use as pure-line varieties. J. R. Harlan gave some results and tentative conclusions from research in Oklahoma, including the following: (1) selection for protein production on the basis of individual-plant analysis is too cumbersome and expensive to be of much value; (2) protein content of individual plants has a low repeatability when the plant is sampled several times and significant differences are difficult to demonstrate; (3) considerable progress has been made in selecting for leafiness in sand bluestem (*Andropogon hallii*); (4) chemical analyses of clones selected for agronomic characters and good general combining ability are highly useful; (5) significant differences in leafiness, protein and P content have been found between clones thus selected; (6) good correlations between tenderness as determined by a simple pull test and acceptance by livestock have been obtained in weeping lovegrass (*Eragrostis curvula*); and (7) the simplest method of improving quality is probably to breed for increased leafiness. E. N. Fergus described breeding tall fescue (*Festuca arundinacea*) for palatability at the Kentucky Station. Progress has been achieved by both inbreeding and maternal-line breeding of most intensively grazed plants. One highly palatable S_3 line is as vigorous as the variety Ky31. This inbred and a synthetic of eight S_3 lines have been more grazed than Ky31 and other varieties. Using inbreds crossed in isolation with Ky31 and a synthetic, a second cycle of selection has been initiated. In addition, tall fescue has been crossed with perennial and annual ryegrass. Treatment of the sterile hybrids has not been helpful but increasing fertility in successive generations has been secured by back crossing with tall fescue.

3032 *Graumann, H. O. Breeding for spotted alfalfa aphid resistance.* (*pp.* 21–22).
In this general discussion of the problem of *Therioaphis maculata*, the value of the resistant variety Lahontan is briefly assessed and methods of breeding for resistance are suggested.

3033 *Hanson, A. A. Uniform grass testing.* (*pp.* 22–23).
The objectives of the cooperative programme of testing are indicated.

3034 *Gibson, P. B. & Baxter, S. C. White clover improvement project.* (*p.* 23).
A regional project sponsored by the US Agricultural Research Service and the South Carolina Agricultural Experiment Station was initiated in 1955. Introductions from many parts of the world are being examined for superior germ plasm with adaptability to the south-east of the USA.

3035 *Cope, W. A. & Car, N. Inheritance of rust reaction in alfalfa.* (*pp.* 23–24).
Four individual plants were studied with respect to the genetics of resistance to *Uromyces striatus.* Two of the parents carried partially dominant genes for resistance while in the other two partially dominant genes for susceptibility were present. Evidence of interallelic interactions was also obtained.

3036 *Holt, E. C. Breeding for resistance to rust: ryegrass. (p. 24).*

Use of Holt PI193145, an introduction from Uruguay, is proposed until more resistant strains have been bred for Texas. At College Station, S_4 plants showing no rust in the field during 1955 were isolated for interpollination or further selfing.

3037 *Allison, J. L. & Sasser, N. C. The nematode problem in the south-east. (pp. 54–55).*

J. L. Allison mentioned that plants of a few lucerne varieties and accessions were resistant to all of the following nematodes in tests in N. Carolina: *Meloidogyne arenaria, M. hapla, M. incognita, M. incognita* var. *acrita* and *M. javanica.* The *Ditylenchus*-resistant variety Lahontan and its derivatives exhibited only moderate resistance to collections of the pest from this state.

3038 *Kreitlow, K. W. Techniques for testing resistance to virus diseases. (p. 56).*

By inoculating the cotyledons or the first simple leaf, Ladino clover may be screened for virus reaction 3–4 weeks after sowing.

3039 *Taylor, N. L. Recurrent selection for anthracnose resistance in red clover breeding. (pp. 56–57).*

A modification of recurrent selection as applied to maize is being used in red-clover breeding at the Kentucky Station. Inbreeding is not necessary since clonal propagation is possible. Desirable clones are selected on the basis of polycross tests. They are then divided into four or more groups and intercrossed in isolation to provide material for another cycle of selection.

3040 *Wells, H. D. Breeding annual ryegrass for resistance to crown rust. (p. 57).*

Westerwold's ryegrass has been artificially inoculated with *Puccinia coronata* in a fog chamber at Tifton, Ga. The original material showed 0·4% resistance. By allowing only rust-free plants to interpollinate, resistance has been increased to 76, 89 and 91% in successive years. No loss of vigour has occurred.

Report of the Fourteenth Southern Pasture and Forage Crop Improvement Conference, Kentucky Experiment Station, Lexington, Kentucky, June 11-13, 1957 : Pp. 40. (Mimeographed).

3041 *Forbes, I. (Jun.) & Wells, H. D. Breeding blue lupine for disease resistance. (pp. 9–10).*

Information is given on a large-scale method of inoculation and screening in the greenhouse, used in breeding disease-resistant blue lupin at the Coastal Plain Experiment Station, Ga. Hybrid material has been obtained from which it is expected that plants having the following characters will be isolated: resistance to *Glomerella cingulata* and *Stemphylium solani*, absence of alkaloid, good production of forage, early maturity, normal seed size, soft seed coat and the genetic markers white flowers, white seeds and lack of purple pigment in the vegetative parts.

3042 *Bates, R. P. Vetch improvement. (p. 10).*

Vicia ervilia, V. atropurpurea, V. cornigera, V. onobrychioides, V. pannonica, V. sativa and *V. sativa* var. *leucosperma* have shown resistance to bruchids in Oklahoma. Putative hybrids obtained from interspecific crosses have died or failed to set seed.

Strains have been selected which show promise of producing more early growth than commercial hairy and Madison vetches, and of being sufficiently winter hardy for southern Oklahoma.

3043 *Burns, R. E. Tannoids in lespedeza. (p. 11).*

Investigations on tannoids in relation to astringency are reported. The main astringent fraction contains leucoanthocyanins which, on hydrolysis, yield chiefly delphinidin and some cyanidin. During most of the season, the same tannoids were present in all varieties of *Lespedeza cuneata* in about the same proportions, although varying in total amount. Mention is made of a screening test in which use is made of vanillin and HCl.

3044 *Harlan, J. R., Brooks, M. H. & Celarier, R. P. Can we break the apomictic barrier? (pp. 11–12).*

Some uses of apomixis in breeding are suggested. The facultative tetraploid *Bothriochloa venusta* has been crossed as ♀ with $6n$ *B. intermedia*, $5n$ and $6n$ *B. ischaemum* and $4n$ *Dichanthium annulatum* at the Oklahoma station. An analysis of the hybrids showed that both n and $2n$ ♀ gametophytes were functional.

The embryology of apomixis is being studied. In general, pseudogamous apospory is found. Sexual embryo sacs are readily distinguishable from asexual by their paired polar nuclei. Antipodals have only been observed in sexual sacs. Multiple sacs are common, as many as seven having been found in a single ovule. The sexual sac is frequently pushed aside by the more readily developing asexual embryos. The pollen appears to have a preference for the asexual sacs. It may eventually prove possible to alter the percentage of sexuality in facultative apomicts by environmental control.

3045 *Smith, T. J. Breeding objectives in forage radiation breeding programs. (pp. 12–14).*
Objectives and results of radiation programmes under way in different states are listed. Useful mutants have been induced in *Lespedeza cuneata*, lupin, rye and oats.

3046 *Hanson, C. H. Natural variation in alfalfa and its implication in breeding. (p. 15).*
The view is expressed that the natural variability of lucerne offers very considerable scope for the breeder, the creation of additional variability by mutagenic agents being unnecessary.

3047 STUCKEY, I. H.
Forage varieties for Rhode Island.
Bull. RI agric. Exp. Sta. 1957 : No. 337 : Pp. 18.
The results of variety trials of smooth bromegrass, cocksfoot, timothy, white and red clover, lucerne and birdsfoot trefoil are reported.

3048 NATH, J. &. SWAMINATHAN, M. S.
Chromosome numbers of some grasses.
Indian J. Genet. 1957 : **17** : p. 102.
Chromosome numbers of species of *Digitaria*, *Eriochloa*, *Brachiaria*, *Paspalum*, *Urochloa*, *Panicum*, *Pennisetum* and *Cenchrus* are reported.

3049 HUTTON, E. M.
Some effects of induced autopolyploidy in white clover, barrel medic and Wimmera ryegrass.
J. Aust. Inst. agric. Sci. 1957 : **23** : 227–31.
A significant intensification of cyanogenic activity has been found in colchicine-induced autopolyploid white clover ($2n = 64$) as compared with diploids ($2n = 32$) and the plants were coarser in appearance. Autotetraploid ($2n = 32$) plants of *Medicago tribuloides* matured three to four weeks later than diploids ($2n = 16$) and set about 20% fewer burrs although the average weight of 100 seeds was increased by 30% to 35%. In the two strains examined 38% and 25% respectively of the polyploid plants combined superior vegetative vigour and late maturity with normal burr production. In the case of tetraploid *Lolium rigidum* ($2n = 28$) a reduction of tiller production was noted together with a coarsening of the stems and intensification of purple pigmentation at the nodes, which were frequently strongly bent. The tetraploids had a longer growing season but set significantly fewer seeds.

2050 MEHTA, R. K. & SWAMINATHAN, M. S.
Studies on induced polyploids in forage crops.
Indian J. Genet. 1957 : **17** : 27–57.
In this survey of the literature on polyploidy in forage plants the following subjects are mentioned: (1) the use of colchicine to produce polyploids; (2) the morphological, physiological and cytological effects of polyploidy; (3) the genetical effects of autotetraploidy; (4) seed setting in autotetraploids; and (5) the economic value of induced polyploids.

3051 Una contribución al conocimiento de las plantas forrajeras de Venezuela. (**A contribution to the knowledge of the forage plants of Venezuela**). Centro de Investigaciones Agronómicas, Maracay 1957 : Pp. 103. (Mimeographed).
Tabulated data on content of moisture, ash, total protein, crude fat, crude fibre, carbohydrate, dry matter, organic matter, Ca, P, total digestible matter and digestible protein, calculated on a wet and dry basis and on a dry basis at 70° C., are presented for 761 samples of forage plants gathered in Venezuela, together with information on botanical classification, stage at which harvested, place of origin and altitude.

3052 PETERSON, M. L., COOPER, J. P. & VOSE, P. B.
Non-flowering strains of herbage grasses.
Nature, Lond. 1958 : **181** : 591–94.
With reference to the literature and some unpublished research carried out at the Department of Agronomy, University of California, and the Welsh Plant Breeding Station, Aberystwyth, the possible practical advantages and disadvantages of cultivating nonflowering strains are discussed, together with problems involved in the development and economic propagation of such strains. In the temperate herbage grasses, at least two polygenically-conditioned responses exist by means of which inflorescence production may by controlled: (1) a "winter" requirement for short-day conditions with or without low temperature, which in some grasses must be satisfied as a prerequisite to floral induction, and (2) a requirement for long photoperiods for floral initiation and subsequent development. Considerable genetic variation with respect to these requirements has been shown to exist within species, its distribution being related to the climatic or agronomic origin of the material.

It should therefore be possible to select, in a particular region, plants which remain vegetative indefinitely, because their photoperiodic and temperature requirements are not satisfied under local conditions. Such selections may then be grown for seed production in districts or under artificial conditions favourable for reproductive development.

Observations in support of the feasibility of these suggestions include those obtained from a recent one-year comparison of the flowering behaviour of the perennial ryegrass S23 at Aberystwyth (52° N.) and Davis, Calif. (38° N.). At Aberystwyth all plants headed, with the exception of two in line 7, whereas in California most lines showed a proportion of nonheading plants, which reached 40% in line 7. The two plants which failed to head under natural photoperiodic conditions at Aberystwyth flowered when transferred to continuous light in the greenhouse. At both stations nearly all the lines were later than the original S23, a significant correlation (+0·828) being obtained between the median heading dates in the two countries. Furthermore, lines which were later heading at Aberystwyth contained a higher proportion of nonheading plants at Davis. It is pointed out that it is not yet known whether plants failing to flower will repeat this behaviour in succeeding years.

Since the seasonal distribution of photoperiod may be determined accurately for any locality and the regional mapping of effective winter temperatures may prove difficult, response to photoperiod offers a more reliable basis for selecting nonflowering strains. Plants for which the critical photoperiod exceeds the longest summer day in the region where the strain is to be used may be sought in late-flowering material from higher latitudes. Another method of obtaining nonflowering material consists of selection within existing late-flowering strains. By selection of Kent perennial ryegrass for early and late flowering at Aberystwyth, a divergence of 41·5 days in mean heading dates and a divergence of 66 days between plants showing the greatest disparity in heading dates were obtained in the third generation. In addition, it may be possible to use natural or radiation-induced nonflowering mutants. Spontaneous mutants of this type have been recorded from inbred progenies of Italian ryegrass at Aberystwyth. It may eventually be possible to induce flowering in unfavourable photoperiods by suitable chemical treatment, thereby overcoming the main difficulty of commercial seed production.

3053 Foury, A.
Les plantes fourragères les plus recommandables au Maroc et dans le Bassin méditerranéen. (**Forage plants which are most recommended for Morocco and the Mediterranean Basin**).
Cah. Rech. agron., Rabat 1956 : **7** : Pp. 47.

Information is presented on the chemical composition of forage obtained from a large number of grasses and leguminous crops tested in the above mentioned regions; for some of the crops varietal differences are shown.

3054 Reeder, J. R.
The embryo in grass systematics.
Amer. J. Bot. 1957 : **44** : 756–68.

Characteristics of the caryopsis and embryo which may be used to aid in suggesting relationships are described and illustrated from studies of about 300 species of grasses representing over 150 genera and all the tribes usually recognized. A striking correlation has been found in most cases between the results described here and those obtained in studies of leaf anatomy and cytology. It is concluded that the Panicoideae is for the most part a natural and homogeneous group while the Festucoideae is extremely heterogeneous and contains many genera having closer affinities with those of the Panicoideae. A tentative grouping of the genera studied is suggested on the basis of the embryo type.

3055 Julén, G.
Über die Effekte der Röntgenbestrahlung bei *Poa pratensis*. (**On the effect of X irradiation on *P. pratensis***).
Züchter 1958 : **28** : 37–40.

Observations were continued on the irradiated material mentioned previously [XXV, 172]. Some X_1 plants, which previously had differed from the untreated mother clone, were now indistinguishable from it; the differences must have been caused by either the environment or physiological disturbance resulting from X irradiation. Four X_1 plants had much longer straw than the parent. X_1 plants were compared with their X_2 progeny; in 109 cases, the progeny were found to be uniform and resembled the mother plant, thus indicating that reproduction had been apomictic. In 38 cases the progeny differed from each other and from the parent so that here reproduction must have been entirely sexual; in 147 cases both apomictic and sexual reproduction had occurred. It could not be decided whether the breakdown of apomixis was the result of gene mutation or a physiological effect of X irradiation; the occurrence of sexual reproduction was not correlated with any morphological mutation or with vigour. The sexual plants will be useful in breeding new types.

3056 Ross, J. G. & Adams, M. W.
The influence of heredity on seed and forage production in smooth bromegrass.
Proc. S. Dak. Acad. Sci. 1955 (1956) : **34** : 16–20.

In studies of inbred and open-pollinated clones of *Bromus inermis*, differences in seed yield were significant within both groups but only the progenies from inbred parents showed significant differences in forage yield. Seed set showed significant positive correlations with seed yield. Positive correlations were also obtained between seed set and seed yield of parents on the one hand and those of open-pollinated progeny on the other. It is concluded that lines with high seed-setting capacity may readily be obtained by mass selection.

3057 Copeman, G. J. F. & Brown, W. J.
The productivity of herbage strains. 1. Perennial ryegrass 1951 to 1954.
Bull. N. Scot. Coll. Agric. 1958 : No. **3** : Pp. 23.

A detailed report is given of the results of a trial of the strains Ayrshire, Irish, Devon Eaver, New Zealand, Kent and S23 at the Grassland Experimental Centre, Muchalls, Kincardineshire, N. Scotland.

3058 Fejer, S. O.
Genetic and environmental components of productivity of perennial ryegrass (*Lolium perenne* L.).
NZ J. agric. Res. 1958 : **1** : 86–103.

Problems of quantitative inheritance were investigated by variance analysis of the clones and selfed and diallel-cross progenies of four parents, in spaced plantings made in July or October. With the exception of the first cut, yields from periodical cuts were positively correlated, but the low degree of significance suggested that no one cut could fully represent annual productivity. Relationships between tiller number and tiller weight were useful for differentiating the parents. Such differentiation was analogous to the usual conception of pasture and hay types. Relationships between tiller number and weight, together with mean weight per seed and self fertility, are discussed from the point of view of the evolution of pasture and hay types. Attention is drawn to the possible pitfall of using clones as indicators of environmental influence in genetical analysis. Heritability estimates for green weight, tiller number, tiller weight, spread and density were generally low; additive genetical effects were however relatively high. Genotype-environment interactions are discussed in relation to the validity of estimates of heritability ratios. Reciprocal differences were of some importance, but no dominance effects were detected. Although the parents showed a differential response to inbreeding, positive correlations were found between the performance of the selfed and diallel-cross progenies.

3059 Torrie, J. H.
Evaluation of general and specific combining ability in perennial ryegrass. (*Lolium perenne* L.).
NZ J. Sci. Tech. 1957 : **38** : 1025–35.

Using diallel crosses, a comparison was made between a group (A) of plants which had been previously selected for general combining ability and another group (B) which had not been selected for this capacity. General combining ability was usually greater than specific in group B, whereas the reverse was found for group A. Estimates of specific combining ability calculated from visual yield scores at different seasons were highly correlated with each other and with those for spring forage yield. The correlation between visual scores for autumn and winter yields was significantly greater than the correlation of the score for autumn or winter yield with the score for spring performance. A highly significant correlation was obtained between visual estimate of yield and weight of green forage. In group B, evidence of reciprocal differences was obtained with respect to visual scores of autumn and winter yields and interaction with season. No consistent reciprocal differences were observed in group A.

3060 **Glasnevin Leafy perennial ryegrass seed.**
Fm. Bull., Dublin : Jan. 1958 : p. 7.

Glasnevin Leafy has been developed at the Plant Breeding Department of University College, Dublin, from plants selected from native pastures. Equal in productivity to S23, it is somewhat earlier in spring growth and less aggressive to clovers.

3061 Naylor, B. & Rees, H.
Chromosome size in *Lolium temulentum* and *L. perenne*.
Nature, Lond. 1958 : **181** : 854–55.

The average lengths of chromosome A in *L. temulentum* and A′ in *L. perenne* and in their hybrid were determined. The ratios of A/A′ with respect to length in the parents and hybrid did not differ significantly, being 1·3 and 1·4 respectively. It is therefore concluded that the difference in the size of the chromosomes in the complements of the two species is mainly due to additional genetic material in *L. temulentum* and not to genotypic disparities. This conclusion was supported by observations on meiosis in the hybrid, unpaired loops at pachytene and asymmetrical bivalents at metaphase being seen.

3062 Harberd, D. J.
A spurious significance in genecological trials.
Nature, Lond. 1958 : **181** : p. 138.

Attention has been directed to the possibility that reduplication of individual genotypes in population sampling may give rise to spuriously low values of the standard error and hence to a misleadingly high significance of difference between populations [cf. 1120]. Further work on *Festuca rubra*, *F. ovina* and pentaploid *Holcus mollis* has provided an indication of the spatial distribution of individual genotypes in natural communities and suggested that the risk of reduplication may in some cases be very high.

3063 Kemmerer, H. R. & Weinard, F. F.
Zoysia grass for Illinois lawns.
Circ. Ill. Coll. Agric. 1957 : No. 778 : unpaginated.

The performance of a new hybrid strain of *Zoysia* spp., Meyer Z–52, is described. It is recommended in places where Kentucky bluegrass does not do well, such as lawns which receive heavy wear, but it remains brown during winter and early spring and is a potential fire hazard during this period. Mention is also made of Emerald, a hybrid with a finer leaf than Meyer but slower growing and able to stand closer cutting.

3064 Celarier, R. P.
The cyto-geography of the *Bothriochloa ischaemum* complex. II. Chromosome behaviour.
Amer. J. Bot. 1957 : **44** : 729–38.

Studies of 57 samples of *B. ischaemum* from most of its geographical range indicate that the basic chromosome number is 10 and that tetraploids, pentaploids and hexaploids occur, all showing some irregularity in chromosome behaviour. Frequent quadrivalents and occasional univalents and lagging chromosomes were found in tetraploids. The hexaploids were of two types, showing either minor irregularities or extreme irregularity, while the pentaploids were similar to the irregular hexaploids. It is concluded that *B. ischaemum* is a polyploid complex in which apomixis has become important and possible origins and genomic constitutions of the species are discussed. It is suggested that *B. ischaemum* var. *songaricas* contains a C genome foreign to *B. ischaemum* var. *ischaemum.*

3065 Celarier, R. P. & Paliwal, R. L.
Basic chromosome number of four in the subfamily Panicoideae of the Gramineae.
Science 1957 : **126** : 1247–48.

An accession of *Iseilema laxum* from Assam was found to have $n = 4$ and to be meiotically regular. The few cases of $n = 4$ reported for the Gramineae are believed to have been derived from a higher basic number.

3066 Vargas S., R.
Comparativo de variedades de sorgo. **(Comparison of sorghum varieties).**
Bol. Estac. exp. agríc. La Molina 1957 : **31** : No. 362 : 15–20.

In trials at Villa, Peru, the forage sorghum Sugar Drip outyielded Kansas Sourless and the broom sorghum White Station exceeded three other varieties tested in yield and quality of fibre and in yield of grain and forage.

3067 Bhatti, A. G., Khan, A. & Musahib-ud-Din.
Some studies on hybrid sorghums for fodder productions.
Agriculture, Pakistan 1957 : **8** : 384–92.

In a comparison between the crosses T20 sorghum x T100 sorghum and T53 Sudan grass x T100 sorghum at Sargodha, the progeny of both crosses showed increased height and delayed maturity as compared with the parent lines, the latter effect being more marked in the Sudan-grass hybrid. This hybrid also showed an increased growth rate while the intervarietal hybrid showed an increase in leafiness.

3068 Aleksanjan, Š. V., Isičko, M. P. & Belaja, O. P.
(Accumulation of carotene and hydrocyanic acid in sorghum x Sudan grass hybrids and the parental forms).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 6 : 113–18. [Russian].

Analyses of hybrids 19–58 and 5 showed them to be not inferior to the parental forms in content of protein, fats, ash, Ca and P and to be superior in some of these components, as they were also in yield of green matter. In HCN content they were intermediate; hybrid 5, though morphologically showing more resemblance to Sudan grass, had a lower HCN content than 19–58, its content varying from 410 to 1732 mg. per kg.

The carotene content was also intermediate between that of the parents, being 47·6–63·9 mg. per kg. in 19–58, 41·6–67·1 mg. per kg. in 5, 39·0–77·8 mg. in Sudan grass and 28·4–49·0 mg. in sorghum. A negative correlation was observed between carotene content and HCN content.

3069 Kasymov, B.
(Artificial pollination of annual graminaceous plants).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 5 : 52–55. [Russian].

The floral biology of *Setaria*, Sudan grass and a hybrid between *Sorghum* and Sudan grass under the climatic conditions of Alma Ata is described and data showing improvements in seed yields and seed sets by supplementary pollination are presented.

3070 Govinda Rao, P. & Koteswara Rao, D.
A new record of *Piricularia* from India.
Indian Phytopath. 1957 : **10** : 107–09.

Isolates of *P. oryzae* from *Brachiaria mutica* growing at Bapatha, Andhra Pradesh, were found to be pathogenic only to *B. mutica* and it is proposed to designate this form as *P. oryzae* f. *brachiariae*.

3071 Bohmont, B. L.
Some variations in morphological characteristics and palatability among geographical strains of *Oryzopsis hymenoides* (Roem. and Schult.).
Univ. Wyo. Publ. Sci. 1957 : **21** : p. 174 (Abst.).

Wide differences in growth habit and caryopsis size and shape were noted among 12 strains. Apparently inherent disparities in palatability were also found.

3072 Colbry, V. L.
Diagnostic characteristics of the fruits and florets of economic species of north American *Sporobolus*.
Contr. U.S. nat. Herb. 1957 : **34** : 1–24.

Detailed taxonomic descriptions of the fruits and florets of 20 species are provided. Information on geographical distribution, habit and economic value is included for each species.

3073 Böcher, T. W. & Larsen, K.
Geographical distribution of initiation of flowering, growth habit, and other characters in *Holcus lanatus* L.
Bot. Notiser 1958 : 111 : 289–300.

Studies of 38 strains from most parts of Europe revealed the following topoclines: (1) flowering in the first year in the south, in the second year in the north; (2) flat leaf cushions, slender geniculate culms and pubescent glumes in western oceanic districts, hemispherical leaf cushions, erect culms and scaberulous or glabrous glumes in continental areas. The somatic chromosome number is 14, and 1–2 accessories have been found in material from some western areas. It is concluded that the centre of diversity lies in western Europe.

3074 Bowden, W. M.
Cytotaxonomy of section *Psammelymus* of the genus *Elymus*.
Canad. J. Bot. 1957 : **35** : 951–93.

The species studied in detail in this investigation and described here are *E. racemosus* ($2n = 28$) vars. *racemosus* and *sabulosus*, *E. arenarius* ($2n = 56$), *E. mollis* ($2n = 28$) spp. *mollis* and its varieties *villosissimus* and *interior* and *E.* x *vancouverensis*. The latter is thought to be a hybrid complex involving *E. mollis* var. *mollis* and *E. triticoides* and occurs in three notomorphs, nm. *vancouverensis* ($2n = 42$) nm. *californicus* ($2n = 42$) and nm. *crescentianus* ($2n = 28$). Three other species were also examined, namely *E. dasystachys* ($2n = 28$), *E. angustus* ($2n = 42$ and 56) and *E. triticoides* ($2n = 28$). Seed set when self and cross pollinated was studied in *E. mollis* ssp. *mollis* var. *mollis*, which was partly to highly self fertile, *E. mollis* ssp. *villosissimus*, *E. arenarius*, which is highly self fertile, and *E.* x *vancouverensis*, which is self and cross sterile. Only a few stainable pollen grains were produced by plants of nm. *californicus* and none by either of the other notomorphs.

3075 Matsumura, S., Sakamoto, S. & Tateoka, T.
***Agropyron* and its related genera.**
Land and Crops of Nepal Himalaya. Scientific results of the Japanese expeditions to Nepal Himalaya 1952–1953. Fauna and Flora Research Society, Kyoto University 1956 : **2** : 249–53.

Notes are given on the cytology and morphology of *A. semicostatum* ($2n=28$), *A. gmelini* ($2n=28$), *Elymus dahuricus* ($2n=42$), *E. sibiricus* ($2n=42$) and *Brachypodium sylvaticum* var. *lozoniense* ($2n = 18$), collected by the Japanese expedition to Nepal in 1952–53. Brief mention is also made of a collection of *A. striatum.*

3076 MATHESON, K. L.
An evaluation of selfing techniques for *Agropyron elongatum.*
Abstr. Thes. Utah St. Univ. 1957 : **5** : p. 23. (Abst.).

Varying the number of spikes enclosed in a vegetable parchment bag did not affect the set of self-pollinated seed. Type of bagging material and bag construction had a greater effect on the weight than on the number of self-pollinated seeds. On the basis of seed weight, vegetable parchment proved to be superior to cloth or kraft paper while sleeves gave better results than bags. The amount of self-pollinated seed produced appeared to be chiefly under genetic control. Self fertility varied from 8·9 to 11·6%.

3077 HANSEN, J. E.
Controlled cross pollination and hot water emasculation of crested wheatgrass, *Agropyron desertorum* (Fisch.) Shult.
Abstr. Thes. Utah St. Univ. 1957 : **5** : p. 19. (Abst.).

"Superior controlled cross pollination treatments featured timely agitation of the pollen within the bags. Air circulated up and down in the bags daily subsequent to anthesis during the flowering period resulted in 90·0 and 97·5 per cent as many seeds per spikelet as from open pollination. The parchment isolation bags had little if any influence on seed sets. The ratio of male to female spikes seemed to have only a minor influence on seed set.

"Emasculation with hot water at 47° C. for 5 minutes reduced the number of viable selfed seeds about 9 times. Female spikes that were emasculated, left intact, and bagged with pollinator spikes intact, produced 44·7 per cent as many viable seeds as spikes that were not emasculated and open pollinated.

"It appears that intact culms when applicable are superior to detached culms in controlled hybridization. For this species, water seemed to be as good a medium for detached culms as any of the solutions used."

LEGUMINOUS FORAGE PLANTS

3078 FRAHM-LELIVELD, J. A.
Observations cytologiques sur quelques légumineuses tropicales et subtropicales. **(Cytological observations on some tropical and subtropical leguminosae).**
Rev. Cytol., Paris 1957 : **18** : 273–92.

Chromosome numbers are given for nine species pertaining to the Mimosaceae, three species of the Caesalpinaceae and 72 Papilionaceous species; illustrations of the chromosome complements are included.

3079 JEKABSONS, V.
Lucerne strain trial.
J. Brit. Grassl. Soc. 1958 : **13** : 70–75.

Strains from France, Canada, the USA, Germany and New Zealand were compared in a trial carried out during 1951–55 in north-west Norfolk, England, by British Field Products Ltd. The trial confirmed the superiority of the early type of French lucerne in this part of the country. W268 and Du Puits produced the highest yields of dry matter and crude protein, combined with a fairly even distribution of yield over the cutting season.

3080 BULLER, R. E. & GONZÁLEZ, M.
Performance of alfalfa varieties, red clover, and alsike clover grown under irrigation at approximately 8,800 feet above sea level in Mexico.
Agron. J. 1958 : **50** : 19–22.

A report is given of the results of tests carried out on ten lucerne varieties and on Alsike clover and the red clovers Kenland and Mammoth during the period 1953–56 near Toluca. The results from the lucerne trial emphasized the need for developing varieties resistant to root, crown and leaf diseases. The well-adapted local variety Apaseo and the Spanish variety Valenciana are recommended as the basis for a breeding programme designed to produce such varieties.

3081 FYFE, J. L.
Lucerne breeding in England and northern France.
NAAS quart. Rev. 1957 : No. 37 : 108–12.

Work in progress at Versailles and Coulommiers, France, and Cambridge, England, is briefly reviewed. In France inbreeding is being used to fix desired characteristics while at Cambridge the possibilities of utilizing heterosis are being investigated. Hexaploid lucerne has been produced at Coulommiers by colchicine treatment and has been found to give high forage yields but low seed yields.

3082 Dudley, J. W.
Inheritance of floral abnormalities in alfalfa.
Iowa St. Coll. J. Sci. 1957 : **32** : 164–66. (Abst.).
[Cf. XXVII, 3079 and XXVIII, 600].

3083 Lewis, W. M.
Combining ability of alfalfa clones for seasonal growth responses and forage yield.
Diss. Abstr. 1957 : **17** : Publ. No. 22,464 : p. 1863. (Abst.).

Eleven clones, 104 of the possible single crosses among the clones, 10 open-pollinated progenies of the clones and 9 commercial varieties were evaluated at the University of Minnesota for forage yield and the following seasonal growth responses: earliness of spring growth, recovery after cutting, autumn dormancy, erectness and amount of flowering. Visual notes for seasonal growth responses were taken on an individual-plant basis; forage yield was recorded on a plot and green-weight basis. Clones, single crosses and open-pollinated progenies differed in yield and seasonal responses. Reciprocal differences were detected only in nine single crosses with respect to yield. Crosses of the types high x high, low x low and high x low with regard to rating for seasonal growth responses were respectively rated high, low and intermediate for these reactions. Data on clones or open-pollinated progenies offered a satisfactory basis for evaluating general single-cross performance. Clonal yield was not however an indication of the yield of the progeny of a clone. The yields of open-pollinated progenies were highly correlated ($r = +0{\cdot}883$) with the averages for the single crosses of the corresponding clones. Genotypic correlations between spring vigour, recovery, and autumn dormancy revealed that a clone, a single cross, an open-pollinated progeny or a commercial variety tended to perform similarly throughout the growing season. Both significant and nonsignificant genotypic correlations were obtained between yield on the one hand and spring vigour, recovery and amount of flowering on the other. General combining ability was evaluated by means of the average forage yield of the single crosses of a clone used as a female and the yield of the open-pollinated progenies. The clones differed in this respect, Minn.247, Minn.265 and Minn.271 being outstanding as general combiners. Thirty-two single crosses exhibited high specific combining ability; in most of these crosses one or both of the parents had good general combining ability.

3084 Godeck, W.
Posibilidades fitotécnicas de los híbridos simples de alfalfa. (**The plant-breeding possibilities of simple hybrids of lucerne**).
Idia 1957 : No. 112 : 10–13.

Among the hybrids from 36 crosses performed among third-generation inbred lines developed from material resistant to stem nematode, six were significantly superior in yield of forage to the standard, hybrid F, which outyields the common land races in Argentina. Some of the male parents used showed high combining ability but these did not include the lines showing the highest degree of self incompatibility. All the hybrids, with one exception, outyielded the standard under conditions of low rainfall.

3085 (**A new high quality variety of lucerne**).
Hlopkovodstvo (Cott.-raising) 1958 : No. 1 : p. 62. [Russian].

Taškent 957 was bred in Uzbekistan. It is productive of seed and hay and is a useful soil improver. The hay can be cut five times in a year.

3086 Saunoris, J.
La génétique de la luzerne II. (**The genetics of lucerne, II**).
Rev. Oka 1957 : **31** : 174–82.

The second part of this review covers attempts to produce lucerne polyploids and studies of tetrasomic inheritance and of the effect of self fertilization on the performance and self fertility of subsequent generations.

3087 Saunoris, J.
Mécanisme de la pollinisation chez la luzerne. (**The mechanism of pollination in lucerne**).
Rev. Oka 1958 : **32** : 1–5.

In this review of the literature on pollination in lucerne, mention is made of the effect of weather conditions on pollination, the importance of tripping and the role played by insects in effecting pollination.

3088 Morley, F. H. W., Daday, H. & Peak, J. W.
Quantitative inheritance in lucerne, *Medicago sativa* L. I. Inheritance and selection for winter yield.
Aust. J. agric. Res. 1957 : **8** : 635–51.

Investigations were carried out at Canberra on the following parents together with their F_1

hybrids: Hunter River, Australian Dry Land, Provence, Hairy Peruvian, Old Franconian, Afghan, Ladak, Canadian Creeping-rooted, Spanish Highland Rhizomatous and *Medicago falcata*. In spaced planting, winter growth expressed as a percentage of summer growth varied from 0 to 42% within crosses. Considerable differences were found between strains with respect to general combining ability for winter production. Interstrain differences in combining ability for summer growth were much less evident. Winter production was relatively high in lines derived from Hairy Peruvian, Hunter River, Australian Dry Land and Provence, but especially poor in lines derived from *M. falcata*, Ladak, Canadian Creeping-rooted and the Spanish strain. Combining ability for summer production was not necessarily an index of combining ability for winter growth. Within strains and crosses winter and summer growth rates were however strongly correlated ($r = 0{\cdot}77$). The results of glasshouse experiments suggested that genetic differences in dormancy were mainly determined by response to low temperatures. The problem of selecting strains for winter growth, while maintaining summer production, is discussed. Genes for winter activity are most likely to be found in material from regions with less severe climates.

3089 Medica resistente alla siccità. (**Lucerne resistant to drought**).
G. Agric. 1957 : **67** : p. 436.

It is recommended that certified seed from Sabina, in the province of Rieti, should be sown in Italy, since in that region conditions are such that natural selection of the most vigorous, drought-resistant plants takes place among plants grown for seed.

3090 Brigham, R. D.
Etiology of and screening methods for Cercospora disease of alfalfa.
Iowa St. Coll. J. Sci. 1957 : **32** : 141–43. (Abst.).

Isolates of *Cercospora medicaginis* from lucerne were found to be pathogenic to lucerne only, while isolates from red clover or sweet clover produced atypical lesions on hosts other than the original species. Diploid lucerne plants showed greater resistance to damage by X rays than did tetraploid plants.

3091 Zaleski, A.
Reactions of lucerne strains to *Verticillium* wilt.
Plant Path. 1957 : **6** : 137–42.

Verticillium albo-atrum attacked in varying degrees all the strains studied in field and glasshouse experiments at Cambridge, England. The early strains lost fewer plants than the later strains.

3092 Smith, O. F.
Reactions of some alfalfa varieties to the stem nematode.
Phytopathology 1958 : **48** : 107–09.

Tabulated data are presented showing the percentage of plants infected by *Ditylenchus dipsaci* in trial plantings of 15 lucerne varieties and one synthetic at Reno, Nevada, in 1956.

3093 **Kansas surveys alfalfa varieties for aphid resistance.**
What's New Crops Soils 1958 : **10** : No. 4 : 23–25.

Seedlings of Lahontan and Nemastan lucerne showed about 68% survival in a survey of the reaction of 31 varieties and strains to *Therioaphis maculata* at Fort Hays, Kansas. Seedlings whose parents had survived infestation in the seedling stage showed an average survival of 50% over that of their parents.

3094 Davies, W. E.
Breeding better clovers.
Agric. Rev. 1958 : **3** : No. 10 : 12–18.

Some problems of breeding white and red clovers are discussed, with reference to work at the Welsh Plant Breeding Station, Aberystwyth. Ample scope exists for the collection and testing of ecotypes from as wide a range of regions as possible, to discover useful sources of germ plasm. The approach to the problem of assessing breeder's material is illustrated by a detailed account of the technique employed in the attempt to develop from Ladino x S100 a large-leaved, robust, tall-growing white clover capable of competing successfully with grass. Preliminary results from the F_3 show a fair degree of correlation between yields from spaced plants and swards with the ryegrass S24 as the companion crop. In work on disease resistance, selection for increased recovery after infection with *Sclerotinia trifoliorum* under artificial conditions has been effected within the highly susceptible early double-cut type of red clover. Progenies of the selections are now to be tested in the disease nursery. The possibility of securing improved forms of red and white clovers by colchicine-induced polyploidy is being explored. Multiplication of new strains is also discussed, the value of leaf markings in strain identification being stressed. Mention is made of a new strain, S100 Nomark, distinguishable from S100 and other strains by the complete absence of leaf markings and essentially similar to S100 in agronomic properties.

3095 DAVIES, W. E.
The yields of pure sown plots of eight white clover strains under cutting.
J. Brit. Grassl. Soc. 1958 : **13** : 34–38.

Data are presented on the dry-matter yields of white-clover strains and unsown species in a trial over a three-year period at the Welsh Plant Breeding Station farm at Frongoch, near Aberystwyth. In general the medium-leaved strains S100, S100 Nomark, Kersey, New Zealand Certified Mother and New Zealand Permanent Pasture gave a higher clover fraction than the small-leaved strains S184 and Kent. The unsuitability of Ladino was shown by its lack of persistency and poor yield. The new strain S100 Nomark gave a similar total yield to S100 [3094].

3096 PANDEY, K. K.
A self-compatible hybrid from a cross between two self-incompatible species in *Trifolium*.
J. Hered. 1957 : **48** : 278–81.

A hybrid plant was obtained from *T. uniflorum* ($2n = 32$) ♀ x *T. repens* ($2n = 32$); it was vigorous, morphologically intermediate between its parents, self fertile and crossed reciprocally with both parents. Its self fertility is explained on the basis of the assumption that the *S* genes in the two species are situated at different loci, which may be on the same homologous chromosome and affected by a high frequency of crossing over, or on different, nonhomologous chromosomes.

3097 ZIMMERMANN, K. F.
Beitrag zur Züchtungsmethodik bei Weissklee (*Trifolium repens*). [**A contribution to methods of breeding white clover (*T. repens*)**].
Züchter 1958 : **28** : 17–25.

Considerable increases in yield of seed and foliage were obtained in a wild population of white clover at Müncheberg by both the polycross procedure and a method involving early selection; in the latter case, seedlings which germinated rapidly were selected and later selections of vigorous seedlings and clones were also made. The range of variation in respect of yield was greater in races from the polycross field than in those obtained by direct selection. No relationship was found between the performance of the parent clones and that of their progeny in the polycross test; some of the clones appeared to have good combining ability. New races, obtained by the above mentioned procedures, outyielded two standard varieties and some did well in a trial of nine provenance types.

3098 MANNER, R.
Hammenhögs Beta vitklöver. (**The Hammenhög white clover Beta**).
Våren 1958. Hammenhögs, Otto J. Olson & Sons AB : 12–15.

This selection from the strain Morsö-Hammenhög has outyielded its parent and Hero, Nora and Robusta over a number of years, the superiority being greater in the first and second cuts than in the third.

3099 YOSHIHARA, K., KAWANABE, S. &. UENO, M.
(**The yield and chemical composition of polyploid Ladino clover**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : 65–67. [Japanese].

The tetraploid strain yielded 20% more foliage and had 2% more moisture than the diploid. Protein yield was similar in the two strains.

3100 MANNER, R.
Hammenhögs Birka alsikeklöver. (**The Hammenhög Alsike clover Birka**).
Våren 1958. Hammenhögs, Otto J. Olson & Sons AB : 6–8.

This new variety, selected for winter hardiness, outyields both Svea and Øtofte in green matter, especially at the second cut and in the second year.

3101 ČERVENKA, V. J. B.
Variačně statistická zkoumání jetele *Trifolium resupinatum*. (**Statistical investigations of variation in the clover *T. resupinatum* L.**).
Preslia 1957 : **29** : 64–70.

Statistical values for the length of corolla, the number of seeds per inflorescence, number of shoots per crown and average number of seed heads per plant are given.

3102 ALMEIDA, J. L. F. DE
Trevos autotetraploides. I. O caso de *Trifolium resupinatum* L. ssp. *suaveolens* (Willd.) Dinsm. [**Autotetraploid clovers. I. The case of *T. resupinatum* L. ssp. *suaveolens* (Willd.) Dinsm.**].
Agron. lusit. 1957 : **19** : 127–44.

By treatment of the shoot meristems with colchicine a number of tetraploid plants were obtained. They were more vigorous and succulent, had larger leaves, remained green longer and flowered later; their power of regeneration was good. Their flowers, which were larger than the diploids, were self sterile; seeds set after cross pollination were larger and their 1000 seed weight was about double that of the diploids.

Mitosis and meiosis were regular in the original material, the number $2n = 16$ being confirmed. Many of the plants resulting from treatment were mixoploid but some pure tetraploids with $2n = 32$ occurred and others were obtained from the mixoploids after selection. One octoploid appeared but failed to survive. No triploids resulting from interpollination of diploids and tetraploids have been observed. The usual irregularities, with frequent formation of tetravalents, often in rings, were observed at metaphase I in the tetraploids but metaphase II was relatively normal and 80–90% of normal pollen grains were formed. The number of seeds per capsule varied from 12·9 to 26·4, compared with 35·3 in the diploid, the seed set in the tetraploids varying from 43·8 to 69%, compared with 79·5% in the diploids. The seeds germinated satisfactorily and since the fertility tended to rise in successive generations it is considered satisfactory for agricultural purposes. C_4 plants grown out of doors have developed well and give evidence of being an improvement on the original diploid for forage production.

3103 ULLMAN, W.
Über den Alexandriner oder Ägyptischen Klee, *Trifolium alexandrinum* L.: Bezeichnungen, Abstammung und Verbreitung, Geschichtliches, Anbauversuche und Anbauausweitung in Vergangenheit und Gegenwart, ferner botanische Überschau. **(On the Alexandrian or Egyptian clover, *T. alexandrinum* L.: names, origin and distribution, history, cultural experiments and expansion of cultivation in the past and the present, also a botanical survey).**
Saatgutwirtschaft 1957 : **9** : 262–65, 293–95, 324–25; 1958 : **10** : 9–11.

It is suggested that *T. alexandrinum* had three centres of origin in the region of the Euphrates. The history of the cultivation of this clover throughout the world is outlined. At Bahtim, the Egyptian Agricultural Society is attempting to breed a single-stemmed variety with a leaf consisting of four or five leaflets. A detailed morphological description of *T. alexandrinum* is provided and four varieties are briefly described.

3104 MESSERI, E.
Osservazioni sulla germinazione, lo sviluppo e la discendenza di *Vicia sativa* L. nata da semi trattati con raggi X. **(Observations on the germination, development and progeny of *V. sativa* L. arising from seeds treated with X rays).**
Caryologia 1957 : **10** : 209–43.

Experiments with two generations of irradiated seed have shown that the effect of treatment is cumulative in successive generations. First and second generation progeny from irradiated seed showed reductions in germination percentage and vigour but when seed produced by the first generation was irradiated the effect as shown by the second generation was appreciably greater. The biological significance of these observations is discussed.

3105 COPE, W. A.
Breeding better sericea.
Res. & Fmg. 1957 : **16** : No. 2 : p. 7.

In this popular note mention is made of some aims in breeding *Lespedeza cuneata* in North Carolina, namely, low tannin, smaller stems with more leaves, resistance to root-knot nematodes and variation in maturity. Several lines with one of the above characters each have been obtained and it is hoped to combine them and also to utilize heterosis.

3106 TROLL, H.-J.
Leistungen von Wachstumsmutanten aus Müncheberger Material von *Lupinus luteus*. **(Performances of growth mutants from Müncheberg material of *L. luteus*).**
Züchter 1958 : **28** : 25–32.

A chronological account is presented of the development of the Weiko series of varieties from mutants of *L. luteus*. Also a new dwarf mutant which arose at Trebatsch from Weiko III is described; it matures early but has some undesirable agronomic characters. The dwarf character, *nanus*, appeared to be controlled by a single recessive factor. Weiko forms were compared with a wild Portuguese type in respect of rate of growth, height at maturity and shoot production; differences in the production of basal shoots seemed to be hereditary. Trials held at Müncheberg indicated that the Portuguese wild lupin surpasses the Weiko forms in yielding capacity for seed and foliage. In most of the trials the fast-growing type of Weiko III with the genotype *crescens celer* outyielded Weiko II (*Crescens*).

3107 TROLL, H.-J. & EFFMANN, H.
Saatgutuntersuchungen verschiedener Anbaustufen weisskörniger gelber Süsslupinen auf Besatz mit pigmentierten und bitteren Körnern. (**Investigations on the proportion of pigmented and bitter seed in seed of different propagation stages of white-seeded yellow sweet lupins**).
Z. landw. Vers.-UntersuchWes. 1956 : **2** : 400–15.

After cross pollination between a plant with white sweet seed and a plant with coloured bitter seed, the proportion of coloured bitter seed to coloured sweet seed in subsequent generations approached a 1 : 1 ratio. Annual selection for white seed of low alkaloid content is recommended for maintaining the quality of sweet lupin seed. Methods of estimating the alkaloid content of seeds are compared.

3108 ATABEKOVA, A. J.
(**Polyembryony, supernumerary cotyledons and fasciation in leguminous plants**).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1957 : No. 28 : 65–70. [Russian].

Observations on a number of species of *Lupinus* have shown that in some species, such as *L. ornatus* and *L. pubescens*, certain races have an unusually pronounced tendency to produce polyembryonic seeds; the tendency is hereditary and the plants produced from such seeds often display various degrees of fasciation.

3109 LAMBERTS, H.
Ein neuer Typus mit nicht abbrechenden Hülsen und ein neuer Artbastard bei Lupinen. (**A new type with non-shedding pods and a new interspecific hybrid among lupins**).
Züchter 1958 : **28** : 15–17.

Recent progress in Holland in lupin breeding is outlined. At Wageningen some races of *Lupinus luteus* were selected which do not shed their pods readily under heat treatment, but will do so if gentle pressure is applied; these races are mainly of Portuguese origin [cf. XXV, 3154]. It is thought that these selections will be suitable for districts where the climate is not too dry. The distinguishing characters of *L. rothmaleri* are listed; it is resistant to frost and *Fusarium oxysporum* but is susceptible to viruses and mildew and has a high alkaloid content and a long period of development. Specimens collected in Portugal were used as pollen parents in crosses with yellow lupins of low alkaloid content. From 35 crosses only two plants reached maturity and produced seed; the F_1 hybrids resembled *L. rothmaleri* in many characters. Attempts to back cross failed except in the case of *L. luteus* x F_1 (*L. luteus* x *L. rothmaleri*), where a few seeds were formed. In view of the fact that unfavourable weather conditions influenced the results of the above experiments, the crosses will be repeated with virus-free plants, under controlled environmental conditions and with cold treatment of *L. rothmaleri*; also the influence of photoperiod has to be studied.

3110 GLADSTONES, J. S.
Einige neu selektierte Stämme der schmalblättrigen blauen Lupine (*Lupinus angustifolius* L.). [**Some newly selected races of the blue lupin (*L. angustifolius* L.)**].
Z. Pflanzenz. 1958 : **39** : 1–10.

Descriptions are provided of 16 strains which differ from the normal form of *L. angustifolius* in the coloration of flowers, seeds or vegetative organs; some of these strains are thought to be new. It seems likely that more races with differing seed colour exist but these are difficult to distinguish on account of the variability in this character found within strains. Tendencies for certain types of colouring to be associated with other plant characters are mentioned. In Western Australia it seems that a certain amount of cross pollination occurs in *L. angustifolius*; this may account for the occurrence of normal plants amongst the progenies of mutant forms.

3111 TROLL, H.-J.
Erbgänge des Alkaloidgehalts und Beobachtungen über Heterosiswirkung bei *Lupinus albus*. (**The inheritance of alkaloid content and observations on the action of heterosis in *L. albus***).
Z. Pflanzenz. 1958 : **39** : 35–46.

A series of diallel crosses made at the Agricultural Institute of Müncheberg between varieties and races from various centres revealed the existence of four independent recessive genes responsible for low alkaloid content in *L. albus*. The two genes designated *mitis* and *suavis* were found in the Müncheberg and Kleinwanzleben races respectively; *nutricius* and *pauper* were found in different Hadmersleben races. It seemed probable that other genes with similar effect were present in some of the races studied. Crosses were made between types with the same genes for alkaloid formation and between types differing in this respect;

with regard to the hybrid vigour shown by the F_1 progeny, no significant differences in respect of plant length and stem width were found between the plants with high alkaloid content and those deficient in alkaloids. The number of pods produced by the sweet progeny was considerably higher than that of the bitter progeny; the difference in respect of seed number was not significant. The author concludes that in the sweet plants there is true heterosis but in the bitter plants, heterosis, the alkaloid content or both these factors may be having an effect.

3112 FORBES, I. (JUN.), WELLES, H. D. & EDWARDSON, J. R.
Resistance to the gray leafspot disease in blue lupines.
Plant Dis. Reptr. 1957 : **41** : 1037–38.

Thirteen strains of *Lupinus angustifolius* displayed resistance to grey leaf spot (*Stemphylium solani*). Gainesville S13 was the most vigorous and productive of these strains and the only one with the desirable character of soft seed coat. It contains lupanin but since this property depends upon a single gene, no difficulty should be encountered in obtaining sweet segregates resistant to grey leaf spot from hybrids between this strain and nonalkaloid plants. The greenhouse technique of inoculation which is described is considered to be satisfactory for use in breeding.

3113 LOUIS-MARIE, P.
Les variétés du lotier corniculé (*Lotus corniculatus*). [**The varieties of birdsfoot trefoil (*L. corniculatus*)**].
Rev. Oka 1957 : **31** : 63–68.

A comparative study of European and American strains is reported, data being provided on growth rate and the morphology of the root, stems and leaves. The European varieties are more useful for hay, the American varieties for perennial pasture.

3114 PEACOCK, H. A.
Vegetative vigor, seed setting, and seed shattering in selections and crosses of birdsfoot trefoil (*Lotus corniculatus* L.).
Iowa St. Coll. J. Sci. 1957 : **32** : 236–37. (Abst.).

The section of this work referring to seed shattering has already been summarized [XXVII, 1327 and XXVIII, 619]. Differences between clones with respect to susceptibility to seed pod dehiscence are thought to be due to genotypic differences. Significant differences in forage yield were found among open-pollinated and diallel-cross progenies within groups. Clones having an upright growth habit recovered more quickly after cutting than prostrate or semiprostrate clones. Correlations observed indicated that plants having a more prostrate growth habit produced more seed than those having an upright habit.

3115 BUBAR, J. S.
An association between variability in ovule development within ovaries and self-incompatibility in *Lotus* (Leguminosae).
Canad. J. Bot. 1958 : **36** : 65–72.

The following taxa were completely self sterile without manipulation: *L. corniculatus*, *L. tenuis*, *L. uliginosus*, *L. weilleri*, *L. suaveolens* and *L. jacobaeus*. A high degree of self fertility was shown in the absence of manipulation by *L. corniculatus* var. *japonicus*, *L. angustissimus*, *L. hispidus*, *L. palustris*, *L. filicaulis*, *L. parviflorus*, *L. divaricatus*, *L. peregrinus*, *L. tetragonolobus* and *Hosackia* sp. The taxa found to be self sterile without manipulation varied in degree of self fertility when manipulated. Ovules within each ovary of the self-fertile taxa examined, viz. *L. corniculatus* var. *japonicus*, *L. palustris* and *L. divaricatus*, developed uniformly, whereas those within each ovary of the self-sterile taxa *L. corniculatus*, *L. tenuis*, *L. suaveolens* and *L. weilleri* varied considerably in rate of development. All ovules in self-fertile taxa may be fertilized while generally less than one-half of those in self-sterile taxa are fertilized. In self-fertile taxa, time of pollination is determined by the time of the automatic rupture of the stigmatic membrane. In self-sterile taxa, rupture of this membrane apparently depends upon insect pollinators. Higher numbers of ovules per ovary compensate for the proportion not fertilized in self-sterile taxa. In discussing the possible relationships between self sterility and self incompatibility in *Lotus*, the author suggests that the fundamental distinction between self compatibility and self incompatibility may be found in the behaviour of the stigmatic membrane. He also outlines the possible mode of evolution of a self-incompatibility system having its origin in loss of the ability of the membrane to rupture automatically, and from a brief examination of the literature suggests that variability in ovule development may serve as a means of prolonging the period during which ovules may be cross-fertilized in other members of the Leguminosae besides allogamous *Lotus* spp.

3116 MOHLENBROCK, R. H.
A revision of the genus *Stylosanthes*.
Ann. Mo. bot. Gdn. 1957 : **44** : 299–355.

Twenty-five species are recognized in this revision.

3117 SEKIZUKA, S. & MUKAIYAMA, S.
(**Studies of native Japanese forage plants. II. On the agronomic characteristics of *Cassia mimosoides***).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : p. 71. [Japanese].

The above species is largely self-fertilized. Differences between strains in respect of habit, vegetative cycle, 100-seed weight, seed colour and incidence of hard seeds are recorded.

ROOTS AND TUBERS

3118 MANNER, R.
Jämförelse mellan sockerbeta och fodersockerbeta åren 1950–56. (**Comparison between sugar beet and sugar mangel in the years 1950–56**).
Medd. Gullåk. VäxtförädlAnst. 1957 : No. 14 : 15–24.

In comparisons of Hilleshög sugar beet and Gullåker sugar mangel, the yields of roots, dry matter and sugar were higher in the latter although the contents of sugar and dry matter were lower.

3119 Voederbieten, 1958. (**Mangels, 1958**).
Landbouwvoorlichting **15** : Bijl. 23; Ber. Rassenkeuze 1958 : No. 240 : Pp. 5.

Information on the yield of roots and dry matter, resistance to bolting, ease of harvesting and keeping quality of 60 varieties tested in the Netherlands during 1954–57 is presented, together with brief notes on individual varieties.

3120 MEIER, W.
Sortenversuche mit Futterrüben. (**Mangel variety trials**).
Mitt. schweiz. Landw. 1958 : **6** : 17–22.

Eight foreign varieties were tested during 1955–57 at different centres in northern Switzerland. Zentaur [Centaur] and Corona gave the highest weight of roots per ha. High yields of dry matter per ha. were given by Zentaur, Corona and Hollandia; the latter had also a high sugar content. Øtofte Gelbe [Øtofte Yellow] produced most foliage.

3121 HÖRBERG, Y.
Weibulls Åring Barres, stam 57. (**Weibull's Åring Barres, strain 57**).
Weibulls Årsb. Växtföräd. Växtodling 1958 : **53** : p. 32.

The above mangel, to be released in spring 1958, has a long cylindrical root and is particularly easy to harvest, having a smooth surface which prevents the soil from clinging. The dry-matter content is about 13% and the variety exceeds Barres Ferritslev by more than 4% in yield of both roots and dry matter per ha.

3122 SHIBUTANI, S., OKAMURA, T. &. NOSE, Z.
(**On the varietal classification of turnips in Japan**).
Shiga Nogyo Tanki Daigaku Gakujutsu Hokoku/(Sci. Rep. Shiga agric. Coll.) 1952 : **1** : 1–8. [Japanese].

Japanese and introduced varieties are classified with special reference to leaf pubescence, leaf and root shape, pigmentation and tendency of the epidermal cells of the testa to swell in water. Varieties of the Japanese type have mainly glabrous leaves in contrast to the pubescent leaves of European turnips. Two varietal groups of European turnips and nine of Japanese varieties are differentiated.

3123 MANNER, R.
Hammenhögs original Gullåker III kålrot. (**The Hammenhög original swede Gullåker III**).
Våren 1958. Hammenhögs, Otto J. Olson & Sons AB : 9–11.

Developed from an individual selected from Wilhelmsburger x Gullåker, Gullåker III has exceeded Gullåker II and other varieties in root yield and was equalled only by Patria Wilhelmsburger in dry matter content. It may be used both for fodder and as a table variety.

3124 MANNER, R.
Undersökningar rörande de svenska kålrotsstammarnas egenskaper såsom matkålrötter. (**Investigations on the table qualities of Swedish strains of swede**).
Medd. Gullåk. VäxtförädlAnst. 1957 : No. 14 : 3–14.

Strains of Gul Svensk [Yellow Swedish], Wilhelmsburg and Bangholm were tested for quality. Wilhelmsburg was judged best in colour and smell when cooked while Bangholm and Gul Svensk were better in flavour, the latter being the least variable. Gul Svensk had the shortest neck, Bangholm the longest. Differences in yield were slight. Gul Svensk had the lowest dry-matter content. Positive correlations were detected between neck length on the one hand and score for attractiveness of appearance and content and yield of dry matter on the other. Yields of roots and dry matter and dry-matter content showed low negative correlations with score for flavour. No positive relationship between sugar content and flavour could be established, but it was found that the ratio sugar : dry matter was higher in varieties with a high dry-matter content than in those with a low. The ratio fibre content : dry matter appeared to be higher in varieties poor in dry-matter content, but intervarietal differences in this character were small.

3125 SKAARE, S.
Gro, en ny klumprotresistent kålrot-stamme fra Vidarshov. (**Gro, a new club-root resistant swede strain from Vidarshov**).
Samvirke 1958 : **53** : 133–34.

Developed at Vidarshov, Norway, from crosses between Göta and Wilhelmsburg Øtofte VIII, Gro [Grow] contains 10·8% dry matter and equals the Bangholm strains in yield of dry matter. It is highly resistant to club root. Although rather low in ascorbic acid content and below average in flavour, the roots are attractive in appearance and store well.

3126 ONIŠČENKO, A. I.
(**Breeders of the Ukraine to the farms**).
Kartofel' (Potato), Moskva 1957 : No. 5 : 45–49.

The achievements of potato breeders in the Ukraine referred to include Wohltmann clone 1177, free from blackening; varieties resistant to wart, late blight, high temperatures and drought; early-maturing seedlings derived from crosses with *Solanum andigenum*; and some varieties with 20–23% of starch in the tubers.

3127 **Holland breeds new varieties of potatoes.**
Windmill, The Hague 1957 : No. 24 : 25–26; also in French p. 27; German 28–29; Spanish 29–31; and Italian 31–32.

The aims and methods of potato breeding in the Netherlands are briefly mentioned in this popular article.

3128 Aardappels, 1958 (Observatieproefvelden). [**Potatoes, 1958 (Observation experimental fields)**].
Landbouwvoorlichting **15** : Bijl. 26; Ber. Rassenkeuze 1958 : No. 243 : Pp. 4.

Details are presented on the yield, dry-matter content and earliness of 38 varieties tested in the observation trials which precede inter-provincial tests in the Netherlands. Brief notes on some of the varieties are included.

3129 WENK, H.
Aus dem Leben eines Pflanzenzüchters. (**From the life of a plant breeder**).
Bayer. landw. Jb. 1957 : **34** : 563–88.

On completing 50 years service as a plant breeder, the author reviews some of his work, special mention being made of the breeding of potatoes at Weihenstephan.

3130 LAUER, F. I.
Recovery of recurrent parent characters from crosses of *Solanum demissum* x *S. tuberosum* in successive backcrosses.
Diss. Abstr. 1957 : **17** : Publ. No. 22,463 : p. 1863. (Abst.).

Two series of F_1 and BC_1–BC_3 progenies of *S. demissum* x *S. tuberosum* were grown. In one series the *S. tuberosum* parent was an S_3 clone and in the other an S_0 clone. Measurements were made on 17 characters in the greenhouse and field. In the F_1 of the first series, the means for haulm characters were generally higher than those in the selfed progeny of each parent, whereas the means for tuber characters equalled those of *S. demissum*. In the F_1 of the second series, the means for haulm and tuber characters were in most cases similar to or lower than those in the selfed progeny of each parent. In the first series, back-cross means closely approached those of the recurrent *S. tuberosum* parent in the BC_3. In the second series, the means for both the BC_2 and BC_3 were approximately similar to those of the recurrent S_0 clone. Except for one character of the haulm, higher mean values were obtained in the F_1 of *S. demissum* crossed with the S_3 clone than with the S_0 parent. In the case of back-cross progenies having *S. demissum* as recurrent parent, the means for haulm characters tended to be higher in the BC_1 than those of the selfed progeny of *S. demissum* and equal in the BC_2 to the means of the last-mentioned progeny. About 50% of the BC_2 plants set seed as abundantly as *S. demissum*.

3131 LEE, J. H.
Seed development following hybridization between diploid *Solanum* species from Mexico, Central and South America.
Diss. Abstr. 1957 : **17** : Publ. No. 22,381 : 1874–75. (Abst.).

A study was made of seed development in

S. pinnatisectum after self pollination and of the causes of seed failure following hybridization of this species with other diploid species. Abundant fruit production resulted from crosses of *S. pinnatisectum* with *S. chacoense*, *S. goniocalyx*, *S. kesselbrenneri* and *S. yabari* but no viable seeds were secured. Evidence was obtained from *S. pinnatisectum* that the nutrition of the developing seed depends upon the successive digestion of the integumentary cells by the endosperm and of the endosperm by the embryo. Seed failure in the above interspecific crosses was due to inability of the endosperm to differentiate normally and function as a nutrient medium for the developing embryo. No fertilization occurred in crosses of *S. pinnatisectum* ♀ with *S. macolae* and *S. simplicifolium*. Failure of these crosses was not however due to pollen sterility since 50–70% of the pollen of both paternal species was stainable with acetocarmine.

3132 DIONNE, L. A.
2,4-Dichlorophenoxyacetic acid as an aid to seed production when widely separated *Solanum* species are crossed.
Nature, Lond. 1958 : **181** : p. 361.

In investigations at the Entomology Laboratory, Canada Department of Agriculture, Fredericton, treatment of the ovaries 24 hr. after pollination with a drop of 3–6 p.p.m. of 2,4-D was found to stimulate ovarian development without inhibiting seed formation. The problem of lack of stimulation of ovarian growth because too few seeds are produced in wide hybridization was thus overcome. The results obtained from *S. chacoense* x *S. stoloniferum* illustrate the value of the method; several hundred crosses attempted in the ordinary way yielded only three or four very small fruits whereas several hundred berries were produced from treated ovaries. Using this technique, viable seeds have been secured from other wide crosses, as well as from selfings of hybrid clones with very low pollen fertility.

3133 KAMERAZ, A. JA.
(Wart resistance of interspecific potato hybrids).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 6 : 35–42. [Russian].

Most varieties of domestic potato classed elsewhere as wart resistant have proved to be so also in the USSR; exceptions are Katahdin and Warba, both of which have been attacked in the Soviet Union; it is nevertheless concluded that the common race in the Soviet Union is the same as that in other European countries and the USA.

Many of the hybrids derived from *Solanum demissum* and *S. semidemissum*, being equal to the domestic varieties in yield and other properties, are also wart resistant. This is particularly true in hybrids where wart-resistant varieties such as Gladstone, Imandra, Priekuli Early or Kameraz 1 served as the domestic variety in back crosses; when Katahdin was used instead much lower proportions of resistant seedlings appeared. Selfed or open-pollinated progenies of resistant hybrids also had a higher proportion of resistant seedlings than those from susceptible ones. Several wart-resistant varieties derived from *S. demissum* are named; Imandra and several other hybrids of *S. tuberosum* x *S. andigenum* are also resistant and resistant hybrids have been obtained in the following combinations: *S. catarthrum* x *S. molinae*; *S. acaule* x *S. rybinii*; certain hybrids from *S. curtilobum*; the majority of the hybrids from species of the series *Commersoniana*, *Glabrescentia* and *Pinnatisecta* used in breeding for resistance to Colorado beetle; a number of hybrids obtained by pollination with a seedling of *S. goniocalyx* x *S. bukasovii*; and hybrids from *S. sucrense*, *S. antipoviczii* and *S. vallis-mexici*.

3134 GEORGIEVA, R., CIKOV, D., GEORGIEVA, J., DILOV, H. & PČELAROV, V.
(Phasic and genetic diversity of regenerated potatoes).
Izv. Inst. Rastenievădstvo (News Inst. Pl.-Industr.), Sofia 1957 : No. 4 : 73–107. [Bulgarian].

Clones of Aquila and Kardinal raised from phasically juvenile sprouts developed larger tubers than material reproduced in the ordinary way by sowing in summer. The first and second generation tubers also differed from the tubers of the initial varieties in having a higher sugar content, greater catalase activity and lower dry-matter content. Spindling sprout and other forms of degeneration were markedly absent. The changes are thought to be heritable and the method useful for breeding new varieties.

3135 HÖPPNER, E. & GEIDEL, H.
Kartoffelprüfungen 1957. **(Potato trials, 1957).**
Kartoffelbau 1958 : **9** : 28–30.

Information is provided on the yield, starch content, size of tubers and date of maturity of each of the varieties included in the West German list of approved varieties.

3136 Kartoffelsorten zur Auswahl. (**Choice of potato varieties**).
Mitt. dtsch. LandwGes. 1958 : **73** : 222–25.

Tabulated data are presented on the yields, soil requirements, shape and colour of tuber, starch content and disease resistance of varieties approved for cultivation in Western Germany.

3137 KELLER, E. R.
Das schweizerische Richtsortiment im Kartoffelbau 1957/58. (**The Swiss official variety list for potato growing, 1957/58**).
Mitt. schweiz. Landw. 1958 : **6** : 4–10.

Data are presented on the yielding capacity, quality, soil requirements, morphological characteristics and disease resistance of 18 varieties.

3138 OGUMA, Y.
[**The characteristics of the newly bred potato varieties Shirayuki and Chitose** (**Kinukawa**)].
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. exp. Sta. 1954 : No. 50 : 153–56. [Japanese].

Shirayuki [White Snow], a selection from Danshaku [Baron] x Honiku 393, is a midseason variety with good flavour. Chitose, alternatively known as Kinukawa, another selection from this cross, is also a midseason variety; it produces a high tuber yield after spring sowing but its quality is indifferent; it has received the Norin [Ministry of Agriculture and Forestry] number 4.

3139 VARGAS SACO, R.
Introducción original de *Solanum tuberosum* subespecie *andigenum* a España. (**The original introduction of *S. tuberosum* subspecies *andigenum* into Spain**).
Bol. trimestr. Exp. agropec., Progr.coop. Exp. Agropec., Lima 1956 : **5** : No. 4 : 15–17.

Theories on the origin of the potato in Europe and particularly in Spain are briefly surveyed, special reference being made to the discovery of *S. tuberosum* ssp. *andigenum* in the Canary islands [XXVI, 2587], suggesting a Peruvian rather than a Chilean origin.

3140 GOTTSCHALK, W.
Über die Anwendung cytologischer Methoden für die Bearbeitung phylogenetischer Fragestellungen bei den Solanaceen. Eine Erwiderung. (**On the application of cytological methods for dealing with phylogenetic questions in the Solanaceae. A reply**).
Z. Pflanzenz. 1958 : **39** : 47–70.

Wangenheim, Frandsen and Ross criticized the author's use of comparative studies of chromosome morphology at pachytene to determine phylogenetic relationships within the Solanaceae [XXVII, 3170]. To substantiate his own point of view, the author refers to his studies of chromosomes in species of *Lycopersicon* and *Solanum* [cf. XXV, 366 and 2157; XXVI, 1417 and 2570 and XXVII, 3168]; he still considers that *S. tuberosum* arose as an autotetraploid and that the basic chromosome number of the genus *Solanum* is $x = 6$.

3141 BIENZ, D. R.
The influence of environmental factors and pollinating techniques on the success of potato pollination in the greenhouse.
Amer. Potato J. 1958 : **35** : 377–85.

The investigations described are based mainly on crosses between B24–58, Katahdin, Canoga, Earlaine, Houma, 9V224–3 and 9V21–11, these clones being representative of the wide variation in ♂ and ♀ fertility found in breeding material. Flowers were pollinated at three stages: (1) about 48 hr. before opening, (2) about 24 hr. before opening and (3) just after the flower had opened. The pollen was usually transferred directly from anther to stigma by means of a scalpel. In some experiments use was instead made of "an oversize ten-penny finishing nail, its head hollowed by drilling with a 3/32 inch bit." Each cup formed by the drilling fitted exactly over the stigma and could contain sufficient pollen to pollinate 60–100 flowers. Since use of the hollow nail ensures that the stigma receives as much pollen as it will hold, this technique would be of particular value in crosses in which fruits do not set readily. Percentage of fruit set was highest for flowers pollinated the day on which they opened or the day after. More seeds per fruit were obtained from flowers pollinated at stage (3) than from those pollinated at (2), while pollination at (2) resulted in more seeds per fruit than pollination at (1). High temperature, measured in degree-hours above 70° F., for a period from 48 hr.

before the flower opened until 72 hr. after opening, caused a greater reduction in fruit set than high temperature on any one day. This effect appeared to be more closely associated with flower maturity than time of pollination. Data were obtained suggesting that most pollen grains germinated after the time when the flower would normally open, regardless of the stage at which the flower was pollinated. Flower position within the cluster and time in the morning at which pollination was effected exerted little influence on fruit set. Pollination in the evening and morning resulted in equally high percentages of fruit set.

3142 Šitov, V. V.
(Abundant berry formation in the potato).
Priroda (Nature), Leningrad 1957 : No. 12: 105–06. [Russian].

Ėpron, Sverdlovsk, Narymčanin [potato from Narym] and some other varieties, including hybrids of *Solanum tuberosum* with *S. andigenum*, *S. demissum* and *S. rybinii*, develop berries abundantly in the province of Sverdlovsk, but not in Kurgan, especially in dry seasons. In the dry 1956 season, which was favourable to berry development in most varieties, 14–312 (Centifolia x *S. demissum* x Narymčanin) produced 68·4 c. of berries and 176·5 c. of tubers per ha. In the trials that have been carried out with 14–312 at Kurgan it yielded 12·5% more tubers and 20·5% more starch than Korenevo and has so far shown resistance to *Phytophthora* and *Synchytrium*. It is regarded as a valuable parent in breeding, especially on account of its highly fertile pollen.

3143 Schark, A. E.
A comparison of microsporogenesis in fertile and sterile potato varieties.
Iowa St. Coll. J. Sci. 1957 : 257–58. (Abst.).

The varieties studied were Katahdin, which is pollen fertile and in which microsporogenesis is normal, Sebago, which is partially pollen fertile and whose inner tapetal cells become slightly plasmolysed before microsporogenesis, and B595–76, which is pollen sterile and is characterized by plasmolysed, dark staining cytoplasm and plasmolysed inner tapetal cells. Meiosis occurs in spite of the plasmolysed state of the cytoplasm but the microspores are large, fragile and probably nonviable. "It is postulated that a nutritional deficiency caused by high temperature exists within the anthers that affects both the cells of the inner tapetum and the pollen mother cells of the varieties B595–76 and Sebago."

3144 Reissig, H.
Über die Möglichkeiten einer züchterischen Verbesserung der biologischen Wertigkeit von Kartoffeleiweiss. **(The possibilities of improving the biological value of potato protein by means of breeding).**
Züchter 1958 : **28** : 51–60.

At the Plant Breeding Institute of Gross-Lüsewitz during 1956 and 1957, a series of mid, early and late-season varieties of potato were studied in respect of their protein and aminoacid content. The essential aminoacid index (EAA) appeared to be positively correlated with the proportion of pure protein (expressed as a percentage of the crude protein). Later varieties had a higher percentage of pure protein than earlier varieties; marked differences were also found between varieties in the same maturity group in respect of their protein content. The aminoacid composition of non-protein nitrogenous material and of the pure protein did not affect the EAA as much as the proportion of pure protein. It is therefore concluded that selection for a high proportion of pure protein is the best method of improving the biological value of the nitrogenous material in potatoes.

3145 Emilsson, B.
Olika faktorers inverkan på potatisens viktsförlust under lagring. **(The influence of different factors upon the loss in weight of potatoes during storage).**
K. Skogs- o. Lantbruksakad. Tidskr. 1957 : **96** : 329–44.

Slight but significant intervarietal differences in tendency to lose weight were detected but could be largely eliminated by suitable storage conditions.

3146 Herrmann, J. & Donath, H.
Über einen Kleinlagerversuch zur Ermittlung der Lagerungsverluste bei Kartoffeln in Abhängigkeit von Sorte, Düngung und Lagerdauer. **(On a small storage trial for investigating the loss during storage in potatoes dependent on variety, fertilizing and duration of storage).**
Z. landw. Vers.- UntersuchWes. 1956 : **2** : 497–506.

Of the seven varieties tested, Mittelfrühe [Middle Early] showed the lowest loss in weight resulting from transpiration and respiration during storage.

3147 Kopal, S.
Obsah neškrobu u brambor. (**The content of dry matter other than starch in the potato**).
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1958 : **31** : 23–36.

Chemical analyses of varieties, differing with regard to origin and use, showed that the content of dry matter other than starch in a variety is positively correlated with starch content. In varieties with a high starch content, excluding typical table varieties, the content of non-starch dry matter was ca. 6·60%; the other varieties had a content of ca. 6·40%.

3148 Unrau, A. M. & Nylund, R. E.
The relation of physical properties and chemical composition to mealiness in the potato. II. Chemical composition.
Amer. Potato J. 1957 : **34** : 303–11.

In an analysis of Red Pontiac, Cobbler and Waseca, mealiness was influenced by the contents of the following in the raw tubers: dry matter, starch, sugar, polysaccharides other than starch, nitrogenous compounds soluble in 85% ethanol and amylose. Mealiness was not related to the content of ash or crude protein of the raw and boiled tubers. Although the correlation between mealiness and dry-matter content was fairly close (+0·88), this association did not hold for varietal comparisons. Within varieties, mealiness was directly proportional to dry matter in Cobbler and Waseca but not in Red Pontiac. [1819].

3149 Plaisted, R. L.
Some components of the variance of specific gravity of potatoes.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 391–96.

Analysis of data on the specific gravity of tubers obtained from several localities in the northern part of the USA yielded estimates of the components of variance which were used in making a table to show the average genetic gain to be expected when varying numbers of varieties, replications, years and localities are involved.

3150 Brücher, H.
Kritische Betrachtungen zur Nomenklatur argentinischer Wildkartoffeln. IV. Die Serie *Tuberosa*. (**Critical considerations concerning the nomenclature of the Argentine wild potatoes. IV. Series *Tuberosa***).
Züchter 1957 : **27** : 353–57.

Solanum famatinae is considered to be a distinct species and not a hybrid between *S. chacoense* and *S. kurtzianum* as maintained by Hawkes. A detailed description of *S. famatinae* is provided; its chromosome number was determined as $2n = 24$. *S. spegazzinii* is held to be a valid species distinct from *S. leptophyes*. Hawkes's theory that genes from the subtropical *S. chacoense* have been introduced into the mountain species *S. spegazzinii* is rejected on geographical and morphological grounds. No evidence was found supporting the suggestion that *S. ballsii* should be retained as a subspecific name for a form of *S. vernei* from Jujuy.

3151 Schreiner, W. & Glieden, W.
Die Ertragsfähigkeit der Kartoffeln im Laufe der Zeit. (**The yielding capacity of potatoes in the course of time**).
Züchter 1957 : **27** : 369–70.

Literature on the yielding capacity of potatoes grown in Germany and western Europe before 1845 was examined. Varieties in current use appear to have similar yielding capacities to those of varieties grown in 1800.

3152 Makarova, L. A.
(**Varieties resistant to high temperature**).
Kartofel' (Potato), Moskva 1957 : No. 6 : 50–51. [Russian].

Certain potato varieties are mentioned which, when sown at such a time that the tubers developed while the soil temperature was 26° C., reduced their tuber yield by no more than 10%, the best being Sibirjak [potato from Siberia], Ella, Bogarnyj [Rain-fed], Ėpron, Ul'janovskij and Ackersegen.

3153 Zadina, J.
Zkoušky bramborů na vzdornost proti plísni bramborové (*Phytophthora infestans*). [**Studying the resistance of potatoes to blight (*Ph. infestans*)**].
Ochr. Rost. 1950 : **23** : 316–39.

An account of Czechoslovakian resistance trials, carried out in 1948 and 1949, is given. Aquila, Erika, Falke, Fytoftoroustojčivyj [*Phytophthora*-resistant], Monica, Robusta, Roswitha, Sandnudel, Kameraz 1 and Kameraz 2 showed resistance to 15 different biotypes of the pathogen.

3154 Schick, R., Schick, E. & Haussdörfer, M.
Ein Beitrag zur physiologischen Spezialisierung von *Phytophthora infestans*. (**A contribution to the physiological specialization of *Ph. infestans***).
Phytopath. Z. 1958 : **31** : 225–36.

After reviewing the literature which indicates that race 4 of *Ph. infestans* has been dominant in Europe and America in recent years, the results are presented of an analysis of the races found in 979 samples of *Ph. infestans* collected from Germany and Central European countries during 1954 and 1955. Races 1; 1,4 and 0 were found in 15·1%, 10·4% and 2·8% of the samples respectively. Specialized races occurred chiefly on hybrids growing in the neighbourhood of plant-breeding stations. It is thought that race 4 has not recently arisen from race 1 but has existed in Europe for at least 25 years. If this were so some apparent anomalies in the reaction of clone 32.1082/2 to blight in a field experiment at Müncheberg in 1932 could be explained. Also in a recent investigation of the resistance genes present in 34 varieties of *Solanum demissum*, R_4 was found to occur more frequently than R_1, although no hybrids of *S. demissum* carrying R_4 exist as cultivated varieties; all such hybrids must therefore have been eliminated by selection. The German designation race A is thought to correspond to race 4 and not to race 0 in the international system.

An increase in the incidence of highly specialized races towards the end of the year was noticed; races 0; 1; 1,4; 4; 1,3,4 and mixtures of 1 and 4 overwintered in the tubers of several varieties. In *S. stoloniferum* another resistance gene, R_6, was determined.

3155 Black, W. & Gallegly, M. E.
Screening of *Solanum* species for resistance to physiologic races of *Phytophthora infestans*.
Amer. Potato J. 1957 : **34** : 273–81.

A list is provided of accessions in which all the individuals were resistant to races 1,2,3; 1,2,4; 1,3,4; 2,3,4 and 1,2,3,4 of *Ph. infestans*. Such resistant lines were found in *S. demissum*, *S. polyadenium*, *S. pinnatisectum* and *S. stoloniferum*; highly resistant accessions were also found in *S. bulbocastanum*, *S. guerreroense*, *S. oxycarpum*, *S. polytrichon*, *S. spectabile* and *S. verrucosum* but in these cases segregation for resistance occurred. The results indicate the presence of one or more unidentified *R* genes and high levels of polygenic resistance. The accessions tested are maintained in the Commonwealth Potato Collection in Great Britain and in the Potato Introduction Station in the USA and the work reported here was carried out at Edinburgh, Scotland, and Morgantown, W. Va.

3156 Zakopal, J.
Výsledky zkoušek na vzdornost k rakovině bramborů. (**The results of testing potatoes for resistance to wart**).
Ochr. Rost. 1950 : **23** : 210–15.

A series of varieties of different origins was tested for resistance to *Synchytrium* under field conditions at Velké Karlovice. Among those resistant to the local biotype were all 10 varieties originating from the United Kingdom, all 16 from Poland, Ostbote, and a Czechoslovakian sample of Parnassia.

3157 Morgan, G. C. & Peters, E. H.
The potato wart disease problem in Newfoundland.
28th Rep. Quebec Soc. Prot. Pl. 1956 : 62–68.

Of the many varieties and seedlings tested in Newfoundland for resistance to *Synchytrium endobioticum*, Sebago was the most promising; Kennebec, Canso, Katahdin and White Cloud were also highly resistant.

3158 Hruška, L.
Poznatky ze studijní cesty do NDR. (**Impressions from a study tour to the German Democratic Republic**).
Věstn. čsl. Akad. zeměd. Věd. 1957 : **4** : 67–70.

This account of breeding work with potatoes at Gross-Lüsewitz lists a number of new varieties characterized by resistance to wart and virus diseases.

3159 Ullrich, J.
Die physiologische Spezialisierung von *Synchytrium endobioticum* (Schilb.) Perc. in der Bundesrepublik. [**The physiological specialization of *S. endobioticum* (Schilb.) in the Federal Republic**].
Phytopath. Z. 1958 : **31** : 273–78.

Using the potato varieties Deodara, Ackersegen, NO-Nova, Ultimus, Mira and two other strains, five biotypes of *S. endobioticum* were identified in Federal Germany.

3160 Gedz', S. M.
[**The importance of vegetative hybridization for raising the immunity of potatoes to wart (*Synchytrium endobioticum* [Schilb.] Perc.)**].
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 9 : 28–30. [Russian].

By covering the plants during the early stages of flowering some of the tubers were induced to form small subsidiary tubers which, after treating with 0·0005% solutions of heteroauxin, were grafted on to normal tubers, from which all sprouts were removed as they developed. When susceptible varieties were grafted in this way on to tubers of a wart-resistant variety they gave rise to seedlings with a lower degree of attack than untreated controls.

3161 ROBINSON, D. B.
Verticillium wilt of potato in relation to symptoms, epidemiology and variability of the pathogen.
Diss. Abstr. 1957 : **17** : Publ. No. 21,865 : p. 1643. (Abst.).

The results obtained from the above investigations at the University of Wisconsin included the following. Evidence was secured in support of the view that isolates of *Verticillium* forming pseudosclerotia represent *V. dahliae* whereas those forming only dark mycelia consist of *V. albo-atrum*. Mixed inocula could be separated *in vivo* into the component types by means of suitable variety-temperature combinations. No change was noted in pathogenicity of monospore cultures of either type after several serial passages through the host plants. Ultraviolet irradiation of a monospore culture of each type resulted in an array of morphological variants but did not induce transformation of one type into the other; the variants were in general less pathogenic than the parents. Resistant varieties of potato were frequently found to be symptomless hosts. Regional differences in the distribution of the two types, together with observations on the epidemiology and symptomatology of the disease, point to the necessity of a regional basis of breeding for resistance.

3162 HUIJSMAN, C. A.
Resistance to the potato root eelworm in *S. tuberosum* subsp. *andigena* and its importance for potato breeding.
Netherlands J. Agric. Sci. 1958 : **6** : 39–46.

[Cf. XXVII, 4166].

3163 WIDDOWSON, E.
Potato root diffusate production.
Nematologica, Leiden 1958 : **3** : 6–14.

Varietal differences have been found in respect of the production of root diffusate and the percentage larval hatch of *Heterodera rostochiensis* caused by the diffusate at various times after break through. Of the ten varieties tested Majestic and Eclipse produced the most active diffusates.

3164 GOFFART, H.
Fortschritte auf dem Gebiete der Züchtung nematodenresistenter Kartoffelsorten. (**Progress in breeding nematode-resistant varieties of potato**).
Kartoffelbau 1957 : **8** : 194–95.

Data are provided on the susceptibility of ten *Solanum andigenum* x *S. tuberosum* crosses to nematodes from several districts in Germany. Hybrids 1/54, 26/54 and 48/54 were found to be completely resistant to all these races of nematode; 18/53 and 43/54 showed resistance to some races but were susceptible to others. The effect of root exudates from some *Solanum* species and varieties on the hatching of nematode cysts was studied; no clear correlation was found between this effect and resistance to nematodes.

3165 GIGANTE, R.
Le reazioni di tre varietà di patate italiane in presenza del virus X, del virus Y e del virus A. (**The reactions of three Italian potato varieties in the presence of virus X, virus Y and virus A**).
Boll. Staz. Pat. veg. Roma 1956 : **14** : 215–29.

Albona, Bianca di Basilicata [Basilicata White] and Mora were graft inoculated with the above virus, using as sources Ersteling, Institut de Beauvais and Allerfrüheste [Earliest of All] respectively. All three showed mosaic symptoms when infected with virus X and Bianca di Basilicata and Mora also showed some cases of dwarfing. Virus Y causes streak and leaf brittleness in all three, mild mosaic in Bianca di Basilicata and Mora and some dwarfing also in the former variety, while virus A causes mild mosaic and dwarfing in these two varieties but dwarfing only in Albona.

3166 LI, L.
(**Studies on the technique of sweet-potato field trials**).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1957 : No. 19 : 1–10. [Chinese].

Uniformity trials using the variety Tai-nung 31 [Taiwan Agriculture 31] in 1954 and Tai-nung 45 in 1955 were set up to determine optimum plot size and shape for estimating root yield. The optimum plot size was found to be 24–48 m²., but this value was much lower when calculated on a cost basis. The direction of the soil fertility gradient appeared to be more important than plot shape.

3167 MOU, T.-S., CHEN, T. & LIAN [LIANG], T.-S.
(**The breeding of the new sweet-potato varieties P_{30}, P_{10} and P_{46} and their adaptation**).
Nung-yeh Yen-chiu/Agric. Res., Taipei 1957 : **7** : 35–38. [Chinese].

Further information is provided on the variety P_{30} [cf. 1277]. P_{10} (Tai-nung 17) [Taiwan Agriculture 17] x Mei-kuo-huang-pi [American

Yellow-skinned] and P_{46} (Tai-nung 44 x Mei-kuo-huang-pi) are varieties of good quality adapted to conditions in northern Taiwan.

3168 Scott, L. E. & Mathews, W. A. **Carbohydrate changes in sweet potatoes during curing and storage.** Proc. Amer. Soc. hort. Sci. 1957 : **70** : 407–18.

Varietal differences were found in the dry matter, starch and sugar contents of the roots at time of harvest and during storage. Starch content decreased during the entire storage period of six months. Sugar content increased during curing and the first two months of storage, decreasing slightly during the final period of storage. The magnitude of these changes differed according to the variety.

FIBRES

Progress Reports from Experiment Stations, season 1955-1956.
Emp. Cott. Gr. Corp. Lond. 1957.

3169 *Rushton, D. F. Survey and summaries of progress reports for the season 1955–56. (pp. 1–16).*

Cotton breeding is among the activities briefly reviewed.

Cotton Research Station, Namulonge, Uganda. Progress report for the season 1955–56.

3170 *Wickens, G. M. & Logan, C. Plant pathology. (pp. 29–32).*

Strains from the Sudan carrying B_2B_{6m} were virtually immune from bacterial blight in seed, leaf and stem inoculations and, except for BP52, were also highly resistant to boll infection. The combination B_2B_3 in Domains Sakel and X1730A did not confer resistance to any phase. As in previous tests of *G. hirsutum*, B_2 on its own failed to confer resistance, B_2B_3 gave good resistance to primary infection of the cotyledons but little if any resistance of the stem or boll, and Albar 51 was highly resistant to all phases. B_3 by itself had the same effect as B_2B_3 in leading to a low incidence of primary infection of the cotyledons but no other resistant reaction. A needle-prick method of inoculating the bolls with bacterial blight has been devised for use in breeding.

3171 *Manning, H. L., Faulkner, R. C. & Kibukamusoke, D. E. B. Plant breeding. (pp. 32–49).*

In selecting successive modal bulks of *G. hirsutum* 'BP52', improvement in lint yield has been at the rate of 2·6% per annum [cf. XXVII, 1950]. The greatest response to selection has been shown by the mean maximum halo length, the lengths of 0MB and 6MB being respectively 30·3 and 34·9 mm.; since the sixth generation, change in halo length has been negligible. Both lint index and seed weight have decreased slightly and ginning outturn has undergone an overall reduction.

Improvement of the yield of BP52 by progeny-row breeding also continued. In the district variety trials, progeny bulks from the fifth generation of selection exceeded local BP52 in yield by about 30%. The advance shown by multiline strains grown from mechanical mixtures of seed of progeny bulks was slightly less. NC55, the multiline strain giving the highest yield, surpassed local BP52 by 28·5%. The yield of the modal bulk 6MB was estimated as 117·7% of that of local BP52.

"UPA" [(MU8 x $BP52^2$) x Albar 51] and Albar strains were selected for technological properties, hairiness and resistance to bacterial blight. Roguing of B181 x BP50 progenies for resistance to *Verticillium* wilt and bacterial blight continued; no plants resistant to wilt were found in the UPA material or among strains of Albar 51 [cf. *loc. cit.*].

Tanganyika Territory, Lake Province. Progress report for the season 1955–56.

3172 *Peat, J. E. & Brown, K. J. General account of the work for the season. (pp. 3–12).*

According to the results of the trial at Ukiriguru, Uk55 has a slightly higher ginning percentage and higher lint index than Uk51 [cf. *loc. cit.*].

3173 *Arnold, M. H. Diseases. (pp. 13–18).*

With the widespread occurrence of boll rot during the season under review, attention was focused on breeding for resistance to this phase of bacterial blight.

In yield trials of blight-resistant hybrids, some Albar 51 back crosses with the best Ukiriguru strains yielded over 20% more than Uk51.

A number of second back crosses involving BAR14/38 (B_2B_{6m}) displayed a high degree of jassid resistance and markedly improved plant habit. These have been further back crossed to Ukiriguru strains; some have also been selfed. Immunity from stem and leaf blight appears to have been obtained by rigorous selection following inoculation. As much of this material as possible will be boll-inoculated. If practicable, breeding will be continued only with plants showing immunity to all phases of bacterial blight.

3174 *Smith, R. Tanganyika Territory, Eastern Province. Progress report for the season 1956. (pp. 1–7).*

The new strain 47/10 is to replace Local over the whole of the province. Since this strain is susceptible to jassid, resistant types are being sought. As an interim measure, several resistant strains are to be bulked as a multiline issue for testing in district plots.

3175 *Hastie, M. S. Kenya, Nyanza Province. Progress report for the season 1955–56. (pp. 1–5).*

Work on varieties was confined to a trial at Kibos.

Sudan. Cotton breeding stations. Progress report for the season 1955–56.

3176 *Rose, M. F. & Hughes, L. C. The Gezira Station. (pp. 3–12).*

The Sakel type BLR14/25 (B_2B_3), which has been accepted as a commercial cotton, was selected for yield.

The programme of hybridization involving the L and S groups of Egyptian cotton continued [cf. *loc. cit.*]; the L group consists of Sakel types and the S group of X1730A and its derivatives.

Transference of lint retention from *G. contextum* and Stormmaster to BLR14/25 has been effected.

An isolated plot of BLR14/25 selected for salt tolerance and BLR14/25 parental stock were bulk-pollinated by the brush method, prior to a laboratory test to determine whether selection by reaction to salt solutions followed by general panmixis has been successful in increasing the degree of tolerance.

3177 *Dark, S. O. S. & Saunders, J. H. Shambat Station. (pp. 13–20).*

Selection of BLR14/25.3 for leaf-curl resistance has been unsuccessful. Resistance will therefore have to be introduced from the L group of varieties and possibly from *G. hirsutum.*

The X1730 type BAR4/24 ($B_2B_3B_{6m}$) gave a satisfactory yield of seed cotton but further selection will be necessary to increase the ginning outturn, which has been reduced to 30·6%.

In the transference of B_{6m} to Sakel, the first back cross to BLR14/25 (B_2B_3) has been selfed; two further back crosses should lead to the development of a satisfactory strain carrying all three genes. Investigation of the black-arm resistance transferred to Sakel from *G. herbaceum* continued. Progress was made in transferring B_{6m} from synthesized Sakel types to strains of Upland.

In breeding jassid-resistant Sakel, the production of hairy stocks is now accomplished. The second stage, already initiated, will be concerned with determining the value of hairiness with regard to crop production. It is necessary to find the type which has the most suitable distribution, density and length of hairs for jassid control, without increased susceptibility to other pests such as white fly and aphids. Current investigations suggest that production of a number of distinct types homozygous for different degrees of hairiness is possible. Hair distribution depends upon major genes individually responsible for hair development on (1) lower leaf lamina (H_1), (2) upper leaf lamina, (3) stem, petiole and lower surface of the veins (H_3) and (4) upper surface of the veins. Among the hairy Sakel cottons so far obtained two types are found: H_1H_3, hairy in all four of the above-mentioned regions, and H_1h_3, with hairiness upon (1), (2) and (4). Hair length and density are under polygenic control. All hairy stocks are being rendered resistant to black arm by back crossing to Sakel strains homozygous for B_2 or both B_2 and B_3.

Transference of the character of 4-locular and 5-locular bolls from *G. hirsutum* to BLR14/25 has been effected, without any marked effect upon lint properties. The genetics of high number of locules has not yet been elucidated with any certainty but the evidence so far obtained suggests that a major gene and polygenes are operative.

Ovule number was determined in 27 strains, mostly derived from back crosses of *G. auritum* x BLR14/25; a plant with 8·53 ovules per locule and 49·2 mm. lint length is cited as an example of the selections made. The BC$_3$ families N39/54 and N40/54, referred to previously as having high ovule number and long lint [cf. *loc. cit.*], equalled the controls Domains Sakel and BLR14/25 in yield and exceeded them in seed number per boll.

Transference of high lint strength from *G. thurberi* to the Sakel type BLJR14/29 ($B_2B_3H_1$) continued. Transference of characters from *G. anomalum* to Sakel cotton is also in progress.

3178 *Rose, M. F. & Low, A. Kadugli Station. (pp. 20–28).*

Selection of the Upland cotton BAR7/8 [BAR SP84(B_2B_3)] for reduced neppiness of the seed coat continued.

3179 *Munro, J. M. Nyasaland. Progress report for the season 1955–56. (pp. 1–9).*

During the past few years CL20 has shown consistent superiority over CLB in staple length and spinning quality. In addition, its shorter and more compact habit of growth is desirable under conditions in Nyasaland. CL20 is therefore to be introduced in place of CLB in the Central and Southern Provinces. Some derivatives of Albar 51 exhibited particular promise, giving yield increases of 25–48% over CLB. It is expected that one of these bacterial-blight resistant strains will ultimately become the standard.

Progenies of panmixis bulks of Albar 49 x CL20 and Albar 49 x BP52 x CL20 were selected for lint index [cf. *loc. cit.*]. Breeding for resistance to bacterial blight will be continued by selection of this material, and by a new series of crosses in which Albar 51 strains are used instead of Albar 49.

Northern Nigeria. Progress report for the season 1955–56.

3180 *King, H. E. & Lawes, D. A. Plant breeding. (pp. 4–15).*

Hybridization continued. Preliminary results suggest that the amount of natural outcrossing at Samaru is high. Testing of material derived from Samaru 26C and its relatives continued. Seed production of 26J, which shows improvement over its parent stock Samaru 26C with respect to yield, earliness and spinning quality, is under way.

Aden Protectorate. Abyan Cotton Experiment Station. Progress report for the season 1955–56.

3181 *Anthony, K. R. M. Plant breeding and agronomy. (pp. 2–7).*

AB3 (bulk filter of X1730A) and BAR XL1 are undergoing selection for a staple length of 1½ in. and greater uniformity. In the attempt to transfer the *Rhizoctonia* resistance of Wilds Early to X1730A, the third back cross to the latter was effected [cf. *loc. cit.*].

3182 *Spence, J. R., Cave, C. T. & Lake, E. B. West Indies. Cotton Experiment Stations. Progress report for the season 1955–56. (pp. 1–15).*

Of the commercial Sea Island cottons tested in St. Vincent for reaction to *Fusarium vasinfectum*, MSI was clearly the most resistant.

Although some strains of MSI have approached VH10 in yield, the latter variety is considered to be a suitable substitute for MSI in Antigua and Nevis on account of its quality premium and the possibility of further increasing its yield by selection.

Breeding work on VH8 continued at the Antigua station.

3183 Kanaš, S.
(The results and prospects of promoting Soviet breeding work with cotton).
Hlopkovodstvo (Cott.-raising) 1957 : No. 12 : 38–44. [Russian].

This report on cotton breeding in the USSR in the past three decades refers to breeding aims, Mičurinist methods employed and varieties bred in earlier and more recent years. Many new varieties exceed 108F in size of bolls, fibre quality and yield and ripen 10–18 days earlier. Some, for instance S1579, 147F, S3381, Uz29 and S3445, show resistance to bacteria and fungi. Some varieties are suitable for manufacture of calico but S4769, S5501, S1625, S9020 and most others are low-gauge *mélange* types with a fibre strength of 5·5–6·0 g., breaking length of 26–28 km. and ginning percentage of the order of 40–42%. Varieties S1780 and S1969 are early-ripening, large-bolled medium-gauge types with lint length of 34 mm., fibre strength of 5 g. and breaking length of 27 km. Among the long-fibred varieties, mention is made of S5496 and S9017 which are characterized by a gauge higher than 5600, fibre strength of 4·9–5·4 g. and breaking length of 27·5–30 km.; the lint length of these varieties is 34–36 mm. Some new varieties, in particular S1843 and 13, have a habit suitable for combine harvesting and greater breaking length and strength of fibre than 108F. S6022 and other new fine-fibred varieties are interesting for earliness, good technological properties and resistance to *Fusarium*. S6022 is earlier and more productive than 5476I, hitherto regarded as the best fine-fibred variety, and has lint length of 40–41 mm., gauge value 7800 and breaking length of 38 km. Its technological properties are superior to Karnak. Some fine-fibred varieties are suitable for combine harvesting.

3184 Ryžov, S. N.
(Scientific research work of the All-Union Cotton Research Institute in 1956).
Bjull. naučn.-teh. Inform. Sojuz NIHI (Bull. sci-tec. Inform. All-Un. Cott. sci.-res. Inst.) 1957 : No. 1 : 3–31. [Russian].

This report of the activities of Sojuz NIHI [All-Union Cotton Research Institute] contains a section on breeding, in which a number of varieties recommended for replacing 108–F in different regions are described. S–1581 is 1–3 days earlier than 108–F and more resistant to deficient water supply during flowering and ripening; it gives 6–8% more raw cotton and 14–15% more lint, since its ginning percentage is also higher, varying from 37 to 39%; the lint is also better in quality. S–315–2 is 3–5 days earlier than 108–F and its prefrost yield is 8–10% higher; S–4727 is 5–6 days earlier and its prefrost yield is 10–12% higher; both these varieties are equal to 108–F in quality. Varieties 149–F and S–1622, both having longer lint than 108–F, are under trial and S–1472, which has long lint of type IV, is thought promising for making fine fabrics; 147–F ripens 10–12 days before 108–F in the high altitudes of Fergana and hence gives 10–15% more yield before the frosts, though its total yield is not greater; its lint is however better in quality. Several promising new varieties still under trial are mentioned.

3185 **(At the United Scientific Conference on Cotton Production).**
Hlopkovodstvo (Cott.-raising) 1957 : No. 12 : p. 15. [Russian].

The conference was held at Taškent. Manolov, the Bulgarian delegate, mentioned new cotton varieties obtained by intraspecific hybridization in Bulgaria. They have growth periods of 110–115, 128–130 and 130–135 days and lint lengths of 28–30, 30–32 and 35 mm. respectively.

3186 PATEL, C. T. & PARMER, M. U.
Effect of soils and climatic conditions on economic characters of the Indo-American cottons tried in Gujarat.
Indian Cott. Gr. Rev. 1958 : **12** : 15–23.

Tabulated data are included showing the yields, ginning outturn, fibre length and fibre weight of some Indo-American cotton strains grown for two seasons in the three regions of Gujarat.

3187 KESAVA IYENGAR, N. & RAMASWAMI, V.
A note on the fibre properties of American cotton raised in rice lands of Madras State.
Indian Cott. Gr. Rev. 1958 : **12** : 50–51.

Tabulated data are presented showing the fibre properties of three short-duration varieties of American cotton, P216F, P23F and H–14, on three soil types in Madras.

3188 GUTIÉRREZ, M.
Estado actual de los trabajos de mejoramiento del algodón en Estados Unidos. **(Present state of the work on cotton breeding in the USA).**
Idia 1957 : No. 115 : 1–40.

A full account is given of the work in progress at the main research stations, governmental and private, and of the main results, most of which have been referred to *passim* in *Plant Breeding Abstracts.*

3189 KENNERLY, A. B.
What's ahead in cotton breeding.
Sth. Seedsman 1957 : **20** : No. 12 : 34, 43.

Changes in the aims and methods of cotton breeding in Texas since 1920 are discussed in this popular article.

3190 NAGESWARA RAO, P.
Contribution of Surat 1027 ALF to the qualitative improvements of Westerns cotton.
Andhra agric. J. 1958 : **5** : 17–20.

Studies at Hagari of the performance of the progeny of crosses among Westerns-1, 1027ALF, Improved Jayawant, Broach 5–7–1 and other Bombay types have shown that early maturity and increased fibre weight have been contributed by types from Dharwar and lint length and fineness together with higher ginning percentage by late maturing Broach and Surat lines, of which Surat 1027ALF was outstanding in respect of the quality of its progeny. Tabulated data of the performance between 1943 and 1952 of lines including 1027ALF in their parentage are included.

3191 IYENGAR, N. K., RAMACHANDRAN, K. & CHANDRAMATHI, P. S.
Further studies on the occurrence of 'crumpled' lethal gene in *Gossypium arboreum*.
Indian Cott. Gr. Rev. 1957 : **11** : p. 515.

The results of crosses made between dwarf 1016 and Rozi indicate that dwarf 1016 carries a third complementary gene for the crumpled condition, designated Cp_c. [Cf. XXVI, 3520].

3192 IYENGAR, N. K., SANTHANAM, V. & BALACHANDRAN, M.
A new multiple species hybrid in *Gossypium*.
Indian Cott. Gr. Rev. 1957 : **11** : 516–17.

The hybrid described here includes *G. raimondii*, *G. hirsutum*, *G. herbaceum* and *G. anomalum* in its parentage. It is sterile, has 52 chromosomes and an average chromosome configuration of $0{\cdot}40_{IV} + 2{\cdot}63_{III} + 10{\cdot}54_{II} + 21{\cdot}43_{I}$.

3193 KESAVA IYENGAR, N., SANTHANAM, V. & RAMACHANDRAN, K.
Inheritance of a new dwarf mutant in *G. arboreum* L.
Indian Cott. Gr. Rev. 1958 : **12** : 10–14.

The mutant described here, designated 1016 dwarf, was found in the F_2 of a cross between two Karunganni cultures, 4829 and 4429, both derived from *G. arboreum* var. *indicum* 49 x (*G. arboreum* var. *indicum* 'N14' x *G. arboreum* var. *cernuum*). In crosses with normal varieties the mutant behaved as a monogenic recessive. It was complementary to d_1, the Anakapelle dwarf, and appeared to be allelic with d_2, the Cocanadas dwarf, and was not linked to the genes for leaf shape or corolla colour.

3194 Ramaswami, V. *et al.*
9030—a new Cambodia strain for the central districts of Madras State.
Indian Cott. Gr. Rev. 1957 : **11** : 518–21.

The above strain is described as a selection from a multiple interspecific hybrid, combining many desirable features from Egyptian, Sea Island, Brazilian and East African cottons. In comparative trials with MCU1 it has given higher lint yields and is hardier, slightly longer in duration, more tolerant of jassids and stem weevil and produces fibre of superior quality. The results of yield and spinning trials are tabulated.

3195 **6186-9—an outstanding strain for the Tinnevellies and Karunganni tract.**
Indian Cott. Gr. Rev. 1957 : **11** : p. 526.

This new strain has outyielded all others in the above regions, is of superior quality and appears to be well adapted in both.

3196 Avtar Singh & Negi, L. S.
Improved strains of Punjab American cotton. III. H.14.
Indian Cott. Gr. Rev. 1958 : **12** : 2–9.

Reselected from 216F [cf. XXVII, 3206], H–14 has consistently outyielded its parent variety in the Hariana tract of the south-eastern region of the Punjab. It gins about 1·5% more and gives finer and stronger fibre, spinning six counts more than that of 216F. It matures about two weeks earlier, thus allowing double cropping.

3197 **(On the Čapaev seed-producing state farm).**
Hlopkovodstvo (Cott.-raising) 1958 : No. 1 : p. 62. [Russian].

The new fine-fibred cotton variety 8763I, now available in Turkmenia, is mentioned. It outyields the previous standards and produces fibre with superior technological properties.

3198 Brown, C. H.
Perennial cotton types in British Guiana.
Emp. Cott. Gr. Rev. 1958 : **35** : 22–23.

Notes are given on the chief characteristics of perennial types found in the coastal districts and interior of British Guiana.

3199 Munro, J. M.
A new cotton variety for Nyasaland.
Nyasald. Fmr. For. 1957 : **4** : No. 1 : 13–14.

The new variety, A637, obtained from the Empire Cotton Growing Corporation in Uganda, is characterized by bacterial-blight resistance, allowing of good yields in wet years, when infection is usually severe. It has outyielded CLB and given a higher ginning outturn and longer fibre in trials in ten localities. In the same trials CL20, selected from CLB, showed better spinning quality than A637 but in other respects it is less satisfactory.

3200 Bhat, N. R. & Patel, C. T.
Compound nature of the 'Cpb' (crumpled) gene in Gaorani-6 strain of cotton.
Indian J. Genet. 1957 : **17** : 19–22.

The Rozi and Gaorani strains of *Gossypium arboreum* have been reported to carry the complementary lethal genes *Cpa* and *Cpb* respectively, yet successful crosses have been made between these strains. From data on the segregation for normal and crumpled seedlings in the F_1 of the cross Rozi x Gaorani 6 (G6) and in back crosses of (Rozi x G6) x G6, it is concluded that the *Cpb* gene consists of two complementary loci. It seems probable that these loci are independent of each other and that one of them is allelic to *Cpa*. A fragment of the original *Cpb* gene may have been translocated to a nonhomologous chromosome and now be functioning as a complementary duplicate of the fragment at the original locus.

3201 Pandya, P. S. & Kulkarni, Y. S.
Observations on boll shedding in some strains of Khandesh cottons.
Indian Cott. Gr. Rev. 1957 : **11** : 456–59.

Tabulated data are included showing the weekly flower and boll production and percentage shedding of NR5, Jarila, Virnar and 29-7-6 in two seasons, 1950–51 and 1951–52, at Jalgaon.

3202 Savov, P.
(Observations on the biology of fertilization in cotton).
Naučn. Trud. (Sci. Trans.) Minist. Zemed., Sofija : Ser. Rastenievădstvo (Pl.-growing) : 1957 : **2** : No. 2 : 11–15. [Bulgarian].

Experiments at Gradište showed that selfed flowers of a variety bore a higher percentage of underdeveloped seed than cross-pollinated or open-pollinated flowers. It was found that the pollen could not develop on immature or over-ripe stigmas. Natural hybridization, both intervarietal and interspecific, was observed, in particular when the seed parent had flowers with protruding stigmas. The natural interspecific hybrids included *Gossypium barbadense* '35–1' x *G. hirsutum* '2367' and *G. hirsutum* '2367' x *G. herbaceum* and *G. hirsutum* '38' x *G. herbaceum*. In addition to these an artificial hybrid between *G. hirsutum* ♀ and *G. arboreum* ♂ is reported. The F_1 of this hybrid resembles the ♂ parent morphologically, but produces fibre with the high quality of the other parent species.

3203 KIMBER, G.
Cryptic twin plants in New World cotton.
Emp. Cott. Gr. Rev. 1958 : **35** : 24–25.

Cryptic twins, in which very small embryos were present in the folds of the cotyledons of the normal seedlings, have been found in strain V135 of Sea Island and a Uganda strain of Upland, examined at the Department of Botany, Manchester University, England. The smaller member of such twins in the latter cotton died at the cotyledon stage. Both members were however raised to maturity in one case of cryptic twinning in V135. The smaller member was diploid and the larger haploid.

3204 LORD, E. & UNDERWOOD, C.
The interpretation of spinning test reports.
Emp. Cott. Gr. Rev. 1958 : **35** : 26–46.

A detailed survey is given of the methods used at the Shirley Institute, Manchester, England, in evaluating new strains of cotton by fibre and spinning tests.

3205 **Spinning test results.**
Emp. Cott. Gr. Rev. 1958 : **35** : p. 47.

A table summarizes the results of fibre and spinning tests recently carried out by the Shirley Institute on samples of strains submitted by the Empire Cotton Growing Corporation.

3206 NAVKAL, H.
Relationship between the single thread strength and the chief fibre properties.
Indian Cott. Gr. Rev. 1957 : **11** : 469–81.

Two tables are included showing the values of a number of fibre quality components, including single thread strength, mean fibre length, mean fibre weight and fibre strength, for about 50 standard Indian cottons in several seasons. Mean fibre length and fibre weight per unit length were found to contribute most to single thread strength.

3207 GUPTE, V. V., NAVKAL, H. & NANJUNDAYYA, C.
Further spinning tests on micro-samples of cotton.
Indian Cott. Gr. Rev. 1957 : **11** : 482–89.

Three tables are included giving the Lea-strength and count-strength product of 55 selections at 40s counts, 53 at 20s counts and 44 at 14s counts.

3208 NAWAZ, S. M.
A comparative study of measurable properties of upland cottons grown in Pakistan and America.
Pakist. Cott. 1957 : **2** : No. 4 : 1–13.

A comparative analysis of Upland varieties grown in Pakistan and the USA leads to the general conclusion that from the point of view of strength and fineness the Pakistani cottons are inherently superior in quality to the American. With the efforts now being made to introduce earliness into new strains by breeding and to improve the ginning industry, a rise in the grade of Pakistani Upland is regarded as assured.

3209 BHATTY, F. A., ANSARI, S. A. & KHAN, E. M.
Calibration of the "micronaire" for desi cottons.
Pakist. Cott. 1957 : **2** : No. 4 : 63–85.

With the increasing emphasis on coarseness in Pakistani local cottons, a suitable technique of testing breeders' material is required. The work reported here on the calibration of micronaire readings, using 108 commercial and experimental cottons, was therefore undertaken.

3210 SUNDARAM, V. & NANJUNDAYYA, C.
A study of the relationship between fibrillar orientation determined by X-ray method and strength of the cotton fibre.
Indian Cott. Gr. Rev. 1957 : **11** : 490–95.

The fibre properties and X-ray diffraction angle are tabulated for five varieties of *Gossypium herbaceum*, three of *G. arboreum* var. *bengalense*, five of *G. arboreum* var. *indicum*, eight of *G. hirsutum*, four of *G. barbadense* and one hybrid between the latter two species. No significant relation was found except in the case of *G. arboreum* var. *bengalense*, in which a correlation coefficient of 0·93 was found.

3211 NAIM, M. S. & HUSSEIN, A. M.
Growth responses of *Fusarium oxysporum* to metabolites of some rhizospheric microflora of Egyptian cotton varieties.
Nature, Lond. 1958 : **181** : p. 578.

Filtrates of *B. subtilis* had an inhibitory effect on the germination of conidia of *F. oxysporum* and filtrates of *B. megaterium* a stimulatory effect. Varietal differences in reaction to the fungus may be associated with disparities observed in the rhizosphere microflora.

3212 ALEKSANDROV, A.
(The principal results of the work in the sections devoted to the biology, breeding and seed production of cotton).
Hlopkovodstvo (Cott.-raising) 1958 : No. 2 : 52–55. [Russian].

This report of a cotton conference mentions new fine-fibred varieties from Central Asia, notably 5230V from Tajikistan, 8763I from Turkmenia and S6002 from Uzbekistan. Variety 5230V is as productive as the standard 5904I but exceeds it in resistance to *Fusarium*, earliness and number of bolls per plant and has longer fibre of superior quality; 8763I is unsurpassed in quality among the fine-fibred varieties, outyields the standard 2IZ, ripens earlier and has a higher ginning outturn and a larger boll; S6002 is resistant to *Fusarium*. Tabular data on yield, growth period, weight of boll and technological properties for other good new varieties, tested in Uzbekistan, Kara-Kalpakia, Kirgizia, Kazahstan, Turkmenia and Azerbaijan, are presented.

3213 Vezelvlas, 1958. **(Fibre flax, 1958).**
Landbouwvoorlichting **15** : Bijl. 24; Ber. Rassenkeuze 1958 : No. 241 : Pp. 3.

Brief descriptions of ten varieties tested in the Netherlands during 1946–56 are presented together with tabulated data on straw, seed and fibre yields.

3214 PETROV, P. M.
(The new flax varieties 50 and 76).
Naučn. Trud. (Sci. Trans.) Minist. Zemed., Sofija : Ser. Rastenievădstvo (Pl.-growing) 1957 : **2** : No. 4 : 1–6. [Bulgarian].

These new dual-purpose varieties from Poljanovgrad yield more seed and stems than the standard Plovdiv 25. They are also more drought resistant and have so far shown resistance to fungi. Variety 50 is the more productive of the two.

3215 SIZOV, I.
(Let us improve the fibre quality of flax and hemp).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 1 : 59–60. [Russian].

In reply to an article by Antropov [XXVII, 4199], the writer states that the flax variety L1120, distinguished by high yield and resistance to lodging and diseases, is of greater economic value than a variety with better quality fibre but lacking the other characteristics. Agronomic and industrial measures likely to improve fibre quality in flax and hemp are discussed.

3216 MATVEEV, N. D.
(On the article "Newly-bred varieties of fibre flax" by A. A. Šuškin).
Lën i Konoplja (Flax & Hemp) 1957 : No. 9 : 33–35. [Russian].

Referring to data on fibre quality in an article by Šuškin [1895], it is pointed out that little or no correlation exists between the technological index known as number, estimated by eye, and actual determinations of the quality and strength of the fibre or of its metric number. No real improvement in the fibre quality of flax varieties can, it is submitted, be expected until breeders are provided with reliable criteria for estimating it.

3217 ŠEVČUK, T. N.
(The flax of Transcarpathia).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 8 : 31–34. [Russian].

The local flax strains of Transcarpathia flowered at the same time as the Pskov flax when grown in the long day of Leningrad but 6–9 days later when grown in a 12-hr. day. They are very variable in height and other characters and some of them are of value for breeding on account of their freedom from lodging, resistance to *Fusarium lini*, yield of seed or quality and yield of fibre.

3218 ATKINS, I. M., FUTRELL, M. C. & MERKLE, O. G.
Observations on curly top of flax in Texas.
Plant Dis. Reptr. 1957 : **41** : 995–1000.

Varieties and selections have shown consistent differences in reaction to curly-top virus but none has proved immune or even highly resistant. Reselection of Sel. 252 (Roman Winter x Argentina Pale Blue) and Sel. 10 and 222 from Turkey x Roman Winter has resulted in some improvement in resistance.

3219 Bócsa, I.

Beiträge zur Züchtung eines ungarischen monözischen Hanfes und zur Kenntnis der Inzuchterscheinungen beim Hanf (*Cannabis sativa* L.). **(Contributions to the breeding of a Hungarian monecious hemp and to the knowledge of inbreeding phenomena in hemp, *C. sativa* L.).**

Z. Pflanzenz. 1958 : **39** : 11–34.

At the Kompolt Experimental Station, Hungary, five years of inbreeding has produced a stable monecious hemp. The effects of inbreeding included shortening of the vegetative period, a considerable degree of protogyny, decrease in stem height and number of leaflets per leaf, chlorophyll deficiency and increased susceptibility to disease, especially *Septoria cannabina.* Amongst the inbreds, masculinized diecious forms occurred which resembled the Reform types described by Fleischmann as spontaneous mutations; in this case the Reform types were too frequent to be mutations.

It is hoped to improve the Hungarian monecious hemp by crossing with monecious types of different origin and with diecious forms; if the diecious form is used as the female parent, the F_1 is entirely female. This F_1 material may then be crossed with the monecious hemp to produce hybrid seed on a large scale, without having to emasculate the female flowers.

3220 **Annual Report of the Indian Central Jute Committee for the year 1955-56** : Pp. 292.

Investigations at the Jute Agricultural Research Institute included the following:—

Jute. Indigenous collections of *Corchorus olitorius* and *C. capsularis* and some exotic introductions were selected. Progeny-row trials of both species, including X-irradiated material, were carried out, a large number of secondary selections being made. Varietal trials were conducted at the Institute and on cultivators' plots. Selections from colchicine-induced tetraploids of *C. olitorius* and *C. capsularis* were carried forward. Some selections of both species segregated into normal and morphologically aberrant types in the X_3 and X_4. Anatomical differences affecting varietal disparities in fibre quality are being analysed. Using varieties of both species, further investigations were carried out on flowering in relation to fibre production, variation in growth components during the complete life cycle, response to vernalization and photoperiod, and salt tolerance.

Further interspecific crosses between cultivated and wild types of *C. olitorius* and *C. capsularis* were attempted, using diploids and tetraploids. The nature of incompatibility between the two species is under cytological investigation. The wide variation observed in type of quadrivalent configuration in autotetraploids of *C. olitorius* suggested that the diploid progenitors were secondary polyploids. Chromosome distribution at meiosis I and II in the autotetraploids was highly irregular.

Vegetative rapprochement has not yet been successful in overcoming incompatibility between *C. olitorius* and *C. capsularis.*

Further work was carried out on the inheritance of a female-sterile type with deeply-serrated leaves, the crumpled-leaf mutant and earliness in *C. capsularis* and of blotched leaf, crumpled leaf and plant height in *C. olitorius.* Crumpled leaf in the former species proved to be a recessive monogenic character. The breeding behaviour of chlorotic selections of both species was also investigated.

Selections were made for resistance to *Rhizoctonia bataticola, Macrophomina phaseoli, Colletotrichum* sp. and *Apion corchori.* The high-yielding varieties JRC–412 and D154 of *C. capsularis* were crossed to combine their desirable characters. The former is early maturing while the latter is late and possesses some resistance to *Rh. bataticola* and *Colletotrichum* sp.

Hibiscus. Further indigenous collections of *Hibiscus* spp. were received. Many secondary selections of *H. cannabinus* and *H. sabdariffa* were made. Study of direct hybrids and back crosses of *H. radiatus* x *H. cannabinus* and the inheritance of anthocyanin pigmentation in *H. sabdariffa* and *H. cannabinus* and of palmately *vs.* partially lobed leaf in *H. cannabinus* continued. Observations on pairing in F_1 hybrids between *H. cannabinus* and *H. radiatus* were indicative of some fundamental differences between the chromosome complements of the two species.

Other crops. Collections of *Crotalaria* spp., *Abutilon* spp. and other fibre crops were studied.

3221 Patel, G. I. & Datta, R. M.

Pollen grain studies in various types of *Corchorus olitorius* L., *C. capsularis* L. and some other species of *Corchorus.*

Grana palynol. 1958 : **1** : No. 3 : 18–24.

In investigations undertaken at the Jute Agricultural Research Institute, Nilganj, West

Bengal, in connexion with the programme of interspecific hybridization, the percentage of pollen fertility ranged from 63·7 to 98·2 in 8 types of *C. olitorius* and from 67·4 to 99·5 in 31 types of *C. capsularis*. Meiosis in all types is usually regular, although cases of hyperploidy and hypoploidy have been noted. The variation in pollen fertility is therefore ascribed to differences in adaptation to climatic conditions at the institute. Of the other species, *C. siliquosus* had the highest pollen fertility (98·5%), followed by *C. sidoides* (91·1%), *C. fascicularis* (90·9%), *C. trilocularis* (90·1%), *C. aestuans* (= *C. acutangulus*) (87·7%) and an unidentified species from Aden resembling *C. tridens* (85·6%). In all species and types the pollen grains were tricolpate, with a reticulate exine. Interspecific differences in pollen-grain diameter were significant, the evolution of the genus in this respect being of the divergent type.

3222 KUWADA, H.
(Crossability in direct and reciprocal crosses between *Hibiscus esculentus* and *H. manihot*, and the morphology and meiosis in the F_1).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 93–102. [Japanese].

H. esculentus ♀ x *H. manihot* ♂ is more fertile than the reciprocal combination and pollen-tube growth is more rapid in the direct cross. The number of fruits was higher in the F_1 of the direct cross than in the reciprocal. The chromosome number of the hybrids is $2n = 96$, with $3–7_{II}$; fertility is low. Reciprocal differences were not observed in meiotic behaviour.

3223 KUWADA, H.
(Crossability in direct and reciprocal crosses between an amphidiploid obtained by breeding and its parents, and the morphology and meiosis in the resultant hybrids).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 103–11. [Japanese].

A detailed description is given of pollen-tube growth, seed setting and seedling development in direct and reciprocal back crosses of the amphidiploid of *Hibiscus esculentus* x *H. manihot* to the two diploid parents. Various reciprocal differences in these respects are reported. In the back cross to *H. esculentus*, $2n = 158$ and the meiotic configurations $28–34_{I} + 56–62_{II} + 0–6_{II}$ were observed; in the back cross to *H. manihot*, $2n = 130$ and the configuration $60_{I} + 32_{II} + 2_{III}$ was noted.

3224 BUSCH, G. & RESENDE, F.
Dominanz-Wechsel während der Entwicklung der Blüte (Aloë) III. Beitrag zu dem chromatographischen Studium der betreffenden Pigmente.
[Change of dominance during floral development (*Aloe*) III. A contribution to the chromatographic study of the pigments concerned].
Portug. acta biol. 1957 : **5** : 45–64.

The cross *Aloe tenuior* var. *rubriflora* x *A. striatula* var. *caesia* studied at Lisbon shows changes in flower colour due to changes in dominance of genes during floral development. Information is presented on the nature of the pigments present at various stages of development in flowers of the parental types and F_1 and F_2 of the above cross and of a back cross to *A. tenuior* var. *rubriflora*. Heterozygotes in the F_1 had pigments differing from those of the parents. Temperature changes affected carotenoid synthesis in heterozygotes but not in homozygotes. Other *Aloe* species showing similar colour changes appeared to differ from the hybrid already mentioned in the composition and mode of inheritance of their flower pigments. [Cf. XXIII, 1610].

3225 BOYCE, W. R.
Resistance to yellow-leaf disease in *Phormium tenax* Forst. and the occurrence of delayed expression of symptoms.
NZ J. agric. Res. 1958 : **1** : 31–36.

One cultivar (SS) and two seedling progenies (the S_1 of SS and the S_2 of cultivar 301) were tested in cages for resistance to transmission of yellow leaf by *Oliarus atkinsoni*. SS was resistant but not immune, and the S_2 of 301 highly susceptible. The S_1 of SS was intermediate between its parent and the S_2 of 301. Evidence was obtained that the expression of symptoms may undergo long delay.

3226 NAKAHIRA, K.
(Studies on breeding trees for special purposes. IV. On artificial hexaploids of *Edgeworthia papyrifera*).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 112–18. [Japanese].

Hexaploids have been obtained by intercrossing 8*x* and 4*x* strains of *E. papyrifera* 'Shizuoka'. The modal meiotic configurations of the 4*x*, 6*x* and 8*x* strains are 18_{II}, $6_{III} + 15_{II} + 6_{I}$ and 36_{II}, respectively. The hexaploids are of interest on account of their rapid growth, height and bark thickness.

SUGAR AND STARCH PLANTS

3227 **Annual Report of the Sugarcane Breeding Institute, Coimbatore for 1954-55** : Pp. 90 + 21 appendices.

In addition to crosses between canes of proven breeding value, crosses were effected between new Co. canes and between introduced and Co. canes [XXVII, 730]. Other crosses were made to develop chewing varieties. The combinations Co.349 Cx P44/101 and CP33/224 x Co.419 consisted of red-rot resistant parents. Co.780 was successfully crossed with *Sorghum durra*. Selfing of Co. varieties as a possible means of securing valuable seedlings was resumed. Crosses utilizing the high-yielding canes Co.603 and Co.678 and the high-quality canes Co.527 and P8331 were made with the aim of developing varieties combining high yield and high sucrose content for tropical conditions. Improvements in breeding technique included a method of adjacent-row crossing, in which a row of the ♀ parent is planted between two different males. Information is given on the parentages and characteristics of the newest batch of Co. canes (Co.1102–Co.1151) to be released for trial.

The following types of ♂ sterility have been distinguished among Co. and other canes: nondehiscence of anthers; production of defective pollen; agglutination of pollen grains; and protogyny combined with poor pollen fertility or with failure of the anthers to emerge from the majority of the spikelets.

Seed remained in a fairly viable condition for six months when the fluff was stored in alkathene bags at 5° C.

Various techniques of colchicine treatment were investigated.

The interrelationship between *S. officinarum* and *S. spontaneum* was studied by means of cytogenetical analysis of back crosses to each species [cf. *loc. cit.*].

Seedlings were raised from the cross of *S. officinarum* 'Manjri Red' with *Erianthus ciliares*. They regularly formed 30_{II} but were all pollen sterile. The hybrids ranged in Brix value from 12·0 to 21·0. Seedlings obtained from the cross of Manjri Red with *Sclerostachya* had $n = 25$–30, 30–32 or 35.

Collection of *S. spontaneum* and other *Saccharum* spp. and of related genera in India has now been completed. The results are given of the study of variants of *S. spontaneum* with respect to developmental aspects, morphology, taxonomy, epidermal anatomy of the stem and rhizome, flowering, chromosome number, drought resistance as indicated by the osmotic pressure of the leaf sap, starch and levulose content of the stem, chemical composition of the juice of the rhizome, and reaction to diseases and pests. Chromosome numbers ranged from $n = 20$ to 48, the wide variation in number being particularly noticeable in collections from Orissa, West Bengal and Bihar. Chromosome number was correlated to a limited extent with plant size and leaf width. Crosses effected to assess the breeding value of *S. spontaneum* are listed. K seedlings selected from *S. spontaneum* crosses were further nobilized. Six K seedlings were superior to the standards Co.205 and Co.285 in sucrose content and purity.

The scheme for the establishment of a world collection of sugar cane at Coimbatore was initiated [XXVII, 740].

The results of investigations on the influence of day length, time of planting and switch over from one photoperiod to another upon flowering in different varieties are reported.

3228 Stevenson, G. C.
Some thoughts on variety selection in sugar cane.
Int. Sug. J. 1957 : **59** : 299–301.

After discussing selection criteria, the author suggests that for increased efficiency in the production of improved varieties better parent varieties are needed, together with better methods of evaluation of parents and seedlings. The importance of heterosis in the progeny of unpromising parents, the use of inbred lines and various methods of progeny evaluation are mentioned.

Proceedings of the Jamaican Association of Sugar Technologists for the year 1956.
J.A.S.T. Journal 1956 : **19** : Pp. 79.

3229 *Carrington, P. L. The effect of the new commercial varieties on the juice quality and yield on the alkaline soils of Shrewsbury Section of the West Indies Sugar Company, Limited. (pp. 13–32).*

The deterioration in juice quality from the above region during the period when B34104 was grown extensively has been remedied by the use of B41227, B42231 and B4362 in place of B34104.

3230 *Smith, C. E. M. Review of the variety situation in Jamaica. (pp. 32–39).*

Tabulated data are included showing the variety acreages as percentages of the total acreage from 1952 to 1956, a comparison of the yields of nine varieties and summaries of the results of varietal trials in different parts of Jamaica.

3231 Stehlé, H. & Petit, R.
Microessais de cannes à sucre, intérêt et développement de la pépinière variétale du Centre de Recherches agronomiques des Antilles. **(Small-scale trials of sugar cane, interest and development of the nursery of varieties at the Agronomic Research Centre of the Antilles).**
Rev. agric. sucr. rhum. Antilles franç. 1957 : **2** : 177–86.

A survey is presented of attempts being made to gather full information on the sugar-cane varieties available in the Antilles and Guiana. New varieties are being tested and taxonomic, physiological and pathological studies are also carried out. Some recent introductions are mentioned and remarks made on the performance of some of these varieties.

3232 **Bureau of Sugar Experiment Stations. 57th Annual Report of the Director to the Hon. the Minister for Agriculture and Stock, Brisbane, Queensland 1957** : Pp. 102.

Sugar cane. A total of 376 biparental crosses was made and a polycross of 590 arrows representing 43 varieties was maintained at the Meringa Experiment Station. Other stations cooperated in seedling testing. Q66 and Q67 are to be added to the approved lists as lodging-resistant varieties for rich land. Q67 resembles its female parent Trojan but has a higher early sugar content. It is expected that Q63, a high-quality cane, will be approved for planting in the Mackay district in 1958. Q65, although a late variety, is considered promising as it offers better cover than most canes developed recently at the Mackay station. H106, also bred at this station, was given the number Q68 and is shortly to be released. In the southern district Q61 was approved for general planting; it is a midseason type derived from POJ2878 x Co.290. **Cowpea.** Selections are to be made from the crosses CPI12153 x Malabar, CPI12153 x Black Eye 5 and Malabar x Black Eye 5.

3233 **Report of the Experiment Station Committee of the Hawaiian Sugar Planters' Association, October 1, 1956 to September 30, 1957** (1957) : Pp. 80.

Further biparental and melting-pot crosses were effected. Chromosome numbers were determined in wild relatives of sugar cane and F_1 hybrids between noble canes and related species. The senior geneticist, J. N. Warner, acted as one of the leaders of an expedition to New Guinea, the chief aim of which was the collection of native chewing canes and their wild relatives in both lowland and highland areas [cf. XXVII, 4220]. Clonal and seed material of noble canes, *Saccharum robustum*, *S. edule* and *S. spontaneum* was obtained. Varieties were tested for reaction to red rot; 37–1933 proved to be the most resistant.

3234 **New sugarcane variety for Florida soils.**
What's New Crops Soils 1958 : **10** : No. 5 : p. 24.

CP50–28, developed jointly by the USDA and the Florida Agricultural Experiment Station, is said to surpass all commercial varieties in respect of early maturity, cold tolerance, ability to produce a new crop from stubble and cane and sugar yields although it shows a tendency to lodge in close stands.

3235 Toohey, C. L.
A new variety—Q70.
Cane Gr. quart. Bull. 1957 : **21** : 52, 57.

This cane, from the cross POJ2878 x H31–2484, has shown great promise in trials in Queensland, giving high yields and a brix of 19·82 as compared with 18·38 given by the standard variety CP29/116. It germinates quickly and reliably and shows good resistance to lodging and moderate to good resistance to frost but it is susceptible to drought.

3236 Price, S.
Cytological studies in *Saccharum* and allied genera II. Geographic distribution and chromosome numbers in *S. robustum*.
Cytologia, Tokyo 1957 : **22** : 40–52.

From an examination of 130 clones, the author concludes that *S. robustum* is represented by two basic cytological types, with $2n = 60$ and 80 respectively. Forms with these chromosome numbers are not only numerically preponderant but meiotically regular. Aneuploids, probable hybrids and suspected hybrid derivatives also occur, with chromosome numbers ranging from $2n = 63$ to 194. The 60-chromosome types are found in Borneo, Celebes and Australian New Guinea, the 80-chromosome types in Dutch and Australian New Guinea, New Britain and the New Hebrides. The following counts were also made in related species occurring in the geographical range of *S. robustum*: $2n = 96$ in *S. spontaneum* from Celebes, and $2n = 80$ in *S. spontaneum*, $2n = 60$ in *Erianthus arundinaceus* and $2n = 38$ in *Miscanthus floridulus* from New Guinea.

3237 SHARMA, S. L. & PRASAD, R.
Studies in sampling technique. VI. Rind hardness in sugarcane.
Proc. Indian Acad. Sci. : Sect. B : 1957 : **46** : 391–402.

Investigations on sampling of rind hardness were undertaken at the Central Sugarcane Research Station, Bihar, to facilitate selection of varieties for different purposes. Rind hardness was measured for five varieties from 100 selected stalks in 1949–50 and for three varieties from all millable cane within 1/40th of an acre in 1950–51. Sector within a single internode, clump, unit of plot division and row were less important than internode and stalk as sources of variation. To estimate rind hardness by the first method within a margin of 5, 2½ and 1% error of the mean, 25, 100 and 500 well-developed stalks, the best of a clump, should be sampled. With the second method, the number of observations required for these percentage errors of the mean would be respectively 50, 250 and 1250.

3238 ARTSCHWAGER, E. & BRANDES, E. W.
Sugarcane (*Saccharum officinarum* L.).
Agric. Handb. US Dep. Agric. 1958 : No. 122 : Pp. 307.

Descriptions and taxonomic keys are given for about 350 accessions of native-garden sugar cane collected in Melanesia, the clones being divided into the New Guinea, New Caledonian, Hawaiian and miscellaneous noble groups. As a background to these descriptions, the handbook provides surveys of the problems of colloquial names for clones of *S. officinarum*, speciation in *Saccharum* and the relative position of *S. officinarum* in the genus, and the geographical origin and dispersal of noble sugar canes. In addition, an account of collecting expeditions (1853–1951) in the region and a detailed analysis of the vegetative characters used in describing and classifying noble canes are included.

Their examination of the systematics of *Saccharum* leads the authors to suggest that "a more factual systematic treatment would be to exclude from the genus as species all but *S. spontaneum* and *S. robustum* and recognize the other variants as horticultural species, divided into two classes if necessary in the future, to distinguish between those derived by mutation and selection from a single ancestral form and those derived from two or more such ancestral forms." Until such drastic revision is made, it is considered that the requirements of classification and convenience are reasonably well satisfied by Jeswiet's scheme, amended by the addition of *S. robustum* and *S. edule*.

In summarizing the evidence on the geographical origin, phylogeny and dispersal of *S. officinarum*, the authors stress the probability that New Guinea constituted the centre of origin of noble canes and their putative *S. robustum* ancestors, attention being drawn to the closer relationship of the native-garden forms to *S. robustum* than to *S. spontaneum*, as indicated by taxonomic and physiological characters and geographical distributions. Three routes of migration of *S. officinarum*, resulting from the transportation of stem cuttings by man, are postulated: (1) a southeastwards dispersal from New Guinea via the Bismarck Archipelago to the New Hebrides, beginning about 8000 BC, (2) migration westwards from New Guinea to Indonesia, the Philippines, Malay Peninsula, Indochina and the arc around the Bay of Bengal, beginning about 6000 BC, and (3) secondary dispersal among the Polynesian Islands, during the period from about 500 to 1100 AD. Possible satellite centres of diversity of the domesticated sugar cane, arising along these routes as the result of natural hybridization with other grasses, including *Erianthus maximus* and *S. spontaneum*, are indicated. It is further postulated that the primitive ancestral *Saccharum* reached New Guinea from Asia during the Cretaceous period by the land bridge formed by the Asiatic-Australian continent, and that in its subsequent isolation in New Guinea by water barriers it evolved into modified wild forms, including *S. robustum*.

3239 DASTANE, N. G.
A comparative study of water relations of drought tolerant and drought susceptible varieties of sugar cane.
J. Aust. Inst. agric. Sci. 1957 : **23** : 346–47.

These studies were conducted at Brisbane; the varieties in descending order of efficiency with respect to water economy were CP29/116, Q47 and Pindar. When subjected to various unfavourable treatments such as frost, heat and submergence of roots, Q47 appeared to be more hardy than CP29/116; it is stated that cell size is associated with hardiness.

3240 HEBERT, L. P. & MATHERNE, R. J.
Effect of wind damage on new sugarcane varieties in Louisiana.
Sug. Bull. N. Orleans 1957 : **36** : 54–56, 59.

An investigation has been carried out of the damage caused by the hurricane Audrey, in

June 1957, to sugar cane varieties in USDA trials at three localities in Louisiana. The percentage of broken stalks in plant cane and first stubble is tabulated for 15 commercial and unreleased varieties. N.Co.310 was distinguished by the almost complete absence of broken stalks at all three localities, while CP36/13, CP29/116 and CP47/193 were only slightly damaged. Most breakage occurred in CP44/101, which occupies over 53% of the sugar cane acreage in Louisiana.

3241 SPENCE, J.-A.
Rapport de visite complémentaire à la Martinique sur la maladie du "leaf scald". (**The report of a supplementary visit to Martinique concerning leaf scald disease**).
Rev. agric. sucr. rhum. Antilles franç. 1957 : **2** : 215–20.

Remarks are made on the susceptibility to *Xanthomonas albilineans* of some varieties of sugar cane cultivated in Martinique; B37.172 appears to be resistant or tolerant. It is thought that the strain of *X. albilineans* in Martinique is the same as that in British Guiana.

3242 STEHLÉ, H., PETIT, R., KEESTRA, R., LAMOTHE, J. & CHAVANNE, R.
Résultats d'un essai quinquennal de comportement variétal en Grande-Terre. (**Results of a quinquennial trial of varietal performance in Grande-Terre**).
Rev. agric. sucr. rhum. Antilles franç. 1957 : **2** : 195–209.

The results are reported of trials held at Beauport with some recent sugar-cane introductions from Barbados; eight of these varieties gave a better performance than the standard 28·78POJ. Of the four best varieties, B46·364 was most promising in respect of yield of cane and sugar per ha. Details are also provided on the rate of growth and tillering of three of the best varieties and on the percentage of all the introductions attacked by *Diatraea saccharalis* during a three-year trial.

3243 ROD, J. & ANDONOV, I.
Studium světelného stadia u cukrového čiroku *S. vulgare* L. var. *saccharatum*. (**A study of the light phase in sweet sorghum, *S. vulgare* L. var. *saccharatum***).
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1957 : **30** : 1209–22.

The beginning of the light phase in five late varieties, two North American and three Italian, was determined by subjecting them to five successive photoperiods of 8 hr. at various stages in development. The development of panicles was accelerated when the treatment coincided with the light phase. All the varieties, which normally fail to ripen in Czechoslovakia, produced ripe seed with the last treatment.

3244 MÜLLER, A. VON
Krautertrag bei Zuckerrübensorten—kritisch betrachtet. (**Foliage yield of sugar beet varieties—critically considered**).
Mitt. dtsch. LandwGes. 1958 : **73** : p. 196.

Details are provided of the yield of fresh foliage, the yield in dry weight of the foliage and the ratio of the yields of root and foliage for 20 sugar-beet varieties tested in 21 districts in Federal Germany during 1954–56.

3245 SIMON, M., WAUTHY, R. & ROUSSEL, N.
L'intérêt des variétés polyploïdes de betteraves sucrières. (**The interest of polyploid varieties of sugar beet**).
Publ. Inst. belge Amélior. Better. 1957 : 13–25.

For the benefit of growers, information is presented on the agronomic properties of polyploid sugar beets.

3246 KRIEBEL, H. B.
Patterns of genetic variation in sugar maple.
Res. Bull. Ohio agric. Exp. Sta. 1957 : No. 791 : Pp. 56.

The study reported here was carried out with specimens of *Acer saccharum* sspp. *saccharum*, *nigrum* and *floridanum* collected as seeds or trees from localities throughout eastern North America and grown at Wooster, Ohio. Morphological and physiological variations were associated with provenance and three ecotypes have been distinguished. The first is a northern hardwood ecotype, characterized by a high degree of apical dominance, relatively low genetic resistance to drought, susceptibility to leaf injury under high insolation and high resistance to winter injury. When grown at Wooster trees of this ecotype from more northerly provenances were susceptible to only slight injury from late spring frosts. Trees of the first two subspecies are included in this ecotype. The second, a central ecotype, also includes trees of the first two subspecies and differs from the northern ecotype in respect of high drought resistance and moderate resistance to leaf scorch, the latter character increasing continuously from east to west. Finally the southern ecotype, identical with the third subspecies, differs from the first two ecotypes by reason of low resistance to winter injury and poor form resulting from a tendency toward repeated forking of the main and lateral shoots. At least two clines were found to transect the ecotypes, namely the cline in time of flushing and a latitudinal cline in time of leaf coloration, resulting in a considerable difference in the length of the growing season within the ecotypes.

3247 Childs, A. H. B.
Trials with virus resistant cassavas in Tanga Province, Tanganyika.
E. Afr. agric. J. 1957 : **23** : 135–37.

The performance of eight BC_3 hybrids from a cross between cassava and ceara (*Manihot glaziovii*), obtained from the East African Agriculture and Forestry Research Organization at Amani, was compared with that of two local varieties at 32 centres in the Tanga and Pangani districts of Tanganyika. The selection 46106/27 performed well on all soil types and is to be distributed to sandy-soil areas while 4763/16 will be distributed to red-soil areas.

3248 Rogers, D. J.
Intraspecific categories of *Manihot esculenta.*
Science 1957 : **126** : 1234–35. (Abst.).

A study was made of the variability of the species in Jamaica and Costa Rica. The 75 cultivars found in these countries are probably representative of types from other regions since many variants are introductions. Classification of the subspecific entities into convariants, subconvariants and cultivars is proposed. The author recognizes two convariants and a large number of subconvariants. In each convariant the characteristics which differentiate the subordinate groups are almost identical, parallel categories having been established. Inferences concerning the origin of the cultivated forms may be drawn on the basis of the proposed classification.

3249 Nishiyama, I. & Watanabe, T.
(Studies on artificial polyploid plants. XVIII. Artificial polyploids of *Amorphophallus konjac*).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 125–28. [Japanese].

Some colchicine-induced tetraploids are described. They differ from their diploid progenitors in having shorter, thicker and less brittle tuber stolons.

3250 Gomi, K.
(Fundamental studies on the drought resistance of *Colocasia.* II).
Miyazaki Daigaku Nogakubu Kenkyu Jiho/Bull. Fac. Agric. Univ. Miyazuki 1957 : **2** : 43–51. [Japanese].

The behaviour of three varieties under conditions of water deficit was compared. The relative resistance of the variety Uhan was associated with higher osmotic pressure of the cell sap and greater ability to grow under conditions of soil-water shortage.

STIMULANTS

3251 Vasil'ev, A. F.
(Breeding work with tobacco should be improved).
Tabak (Tobacco) 1957 : No. 4 : 53–54. [Russian].

This survey of breeding research at the Tobacco Institute and its branch stations mentions a few new varieties. Ostrolist B2747 [Pointed-leaf B2747] (Volžanin 1605/333 [tobacco from the Volga 1605/333] x Trebizond 1867) is productive of large high-quality leaves and its smoking properties are at least as good as those of Trebizond-type tobaccos. It can be spaced more widely than other varieties when grown in squares. Among the new varieties adapted to cultivation under irrigation in Central Asia and Kazahstan are Trebizond 161, Dubec 7 and Dubec 576. All these were obtained by multiple hybridization involving *Nicotiana digluta* or *N. ditagla.* These forms imparted immunity from *Erysiphe* and mosaic.

A number of varieties with the smoking properties of Samsun 27, suitable for cultivation in Armenia, Abhazia or Adžaria, were developed. Some are productive, others resistant to frost, but none show an appreciable improvement in resistance to diseases.

3252 Staševskaja, Ju. A.
(The breeding of highly productive *Nicotiana rustica* hybrids, resistant to tip chlorosis and scald).
Tabak (Tobacco) 1957 : No. 4 : 49–52. [Russian].

A number of heterotic hybrids more productive than the standards Hmelovka 1253 and Vysokoroslaja Zelenaja 317 [Tall Green 317] and showing improved resistance to leaf spot, tip chlorosis and scald were bred at Kiev. Some hybrids maintained heterosis for yield and resistance in the F_2 and F_3. The best among them were direct and reciprocal hybrids of Vengerskaja Kappa [Hungarian Kappa] x Gollandka [tobacco from Holland], hybrids of Vengerskaja Kappa with Vysokoroslaja Zelenaja 317 or Pomorskaja 12 [Littoral 12] and the hybrid Stalingrad x Bakun Svetlyj [Pale Bakun].

3253 Swaminathan, M. S. & Murty, B. R.
One-way incompatibility in some species crosses in the genus *Nicotiana*.
Indian J. Genet. 1957 : **17** : 23–26.

The crosses *N. tabacum* x *N. rustica* and *N. tabacum* x *N. debneyi* fail whereas the reciprocal crosses succeed. *N. tabacum* has a longer style than the other species and the pollen tubes of the latter fail to grow through the complete length of the style of *N. tabacum*. Successful crosses were made after the style of the *N. tabacum* parent had been shortened but in the cross with *N. rustica* only a few seeds were set and so post-fertilization aberrations may have occurred.

3254 Smith, H. H. & Sand, S. A.
Genetic studies on somatic instability in cultures derived from hybrids between *Nicotiana langsdorffii* and *N. sanderae*.
Genetics 1957 : **42** : 560–82.

Variegated flowers of several types have appeared in progeny from the above cross [cf. VII, 1324] and are described and designated variegated–1, which may be (i) speckled, (ii) sectorial, (iii) rare sectorial or (iv) dark speckled - light speckled - sectorial, and variegated–3. It is suggested that variegated–1 plants possess a recessive, unstable allele, v, and *N. sanderae* a dominant, stable allele, V, on chromosome 2. The different phenotypes of the forms of variegated–1 are explained on the basis of two unstable alleles, v_s and v_S at the v locus, such that the genotype of the speckled form is v_sv_s, of the sectorial v_Sv_s and of the rare sectorial v_Sv_S. Aberrant phenotypic variegation is attributed to somatic mutation and aberrant genetic ratios to interallelic mutation in the germinal tissue.

3255 Izard, C.
Obtention et fixation de lignées tumorales et non tumorales à partir de mutations expérimentales de l'hybride *N. glauca* x *N. langsdorffii*. (**Production and fixation of lines with and without tumours from experimental mutations of the hybrid *N. glauca* x *N. langsdorffii***).
Ann. Inst. exp. Tab. Bergerac 1957 : **2** : No. 4 : 65–70.

The substance of this paper has been summarized from another source [XXVII, 4252].

3256 **Dixie Bright 28.**
Bull. NC agric. Exp. Sta. 1954 : No. 393 : Pp. 11.

A more detailed account is given of the characteristics of this variety, first released in 1954 [XXIV, 530].

3257 Ortiz R., G.
Situación del cultivo de tabaco en el Valle del Cauca. (**The state of tobacco cultivation in the Valle del Cauca**).
Agricultura trop. 1957 : **13** : 693–99.

Among varieties adapted to the above region are the high-yielding local race Común Tuluá [Tuluá Common] with fine texture and veins and good elasticity, the cigarette tobacco Piño, with erect leaves, short internodes and good colour and aroma, and Dovio (Valle 59), developed from Palmira 12 x Georgia Shade Grown, which is resistant to mosaic and has finely-veined, cordate leaves with a good aroma, but rather dark in colour after curing.

3258 Izquierdo Tamayo, A. & Durán Grande, M.
Estudios citológicos en el género *Nicotiana*. I.—Observaciones comparadas sobre la mitosis somática, en *Nicotiana rustica* y *Nicotiana tabacum* 2*n* y 4*n*. (**Cytological studies in the genus *Nicotiana*. I. Comparative observations on somatic mitosis in *N. rustica* and *N. tabacum* 2*n* and 4*n***).
Bol. Inst. Invest. agron., Madr. 1957 : **17** : 131–97.

Detailed descriptions, accompanied by illustrations, are given of mitosis in root meristems in the above material. The number of nucleoli varied in each species, the maximum being 5 and 12 in *N. rustica* 2*n* and 4*n*, respectively, and 3 and 5 in *N. tabacum* 2*n* and 4*n* respectively. Fragmentation and bridge formation were observed in both 2*n* and 4*n* *N. rustica*.

3259 Scarascia, G. T.
Ricerche sugli effetti della radiazione in *Nicotiana*. II: Modificazioni morfologiche ed irregolarità meiotiche in piante di *Nicotiana tabacum* L. derivate da semi trattati con neutroni termici. (**Research on the effect of radiation on *Nicotiana*. II: Morphological variations and meiotic irregularities in plants of *N. tabacum* derived from seeds treated with thermal neutrons**).
Caryologia 1957 : **10** : 304–29.

Results similar to those reported previously [XXVI, 1568 and XXVII, 3304] have been obtained with four varieties. Virginia Bright, Xanthy-Yakà [Xánthe Foot-hills] and Burley were more radiosensitive than Maryland-Benincasa.

3260 Renier, A. & Mounat, A.
Comparaison de variétés de tabac Paraguay de diverses origines. Essais 1953–1954–1955. (**Comparison of Paraguay tobacco varieties of various origins. Tests 1953-54-55**).
Ann. Inst. exp. Tab. Bergerac 1957 : **2** : No. 4 : 71–83.

Data are provided on yield, physical qualities and nicotine content of seven varieties tested at Bergerac. Périgueux 48 gave the highest yield and La Reóle had the lowest nicotine content.

3261 Apple, J. L.
The search for better black shank resistance.
Res. & Fmg. 1957 : **16** : No. 2 : 8–9.

Crosses between *Nicotiana plumbaginifolia* and a tetraploid *N. tabacum* strain, 402, in North Carolina, gave F_1 progeny highly resistant to *Phytophthora parasitica* var. *nicotianae.* About 60% of the F_2 were resistant and the resistance of one plant equalled that of *N. plumbaginifolia.* Back crossing of this plant to 402 has given resistant plants of improved quality. Second generation plants from γ-irradiated seeds of five susceptible varieties are being screened for resistance under field and greenhouse conditions.

3262 Apple, J. L.
Pathogenic, cultural, and physiological variation within *Phytophthora parasitica* var. *nicotianae.*
Phytopathology 1957 : **47** : 733–40.

Considerable variation in pathogenicity was found among 200 isolates of the above fungus from North Carolina, nine other states of the USA, Java, Sumatra, India and Puerto Rico and it is suggested that the increase of the highly pathogenic biotypes which are found on resistant tobacco varieties probably occurs as a result of adaptive selection in fields continuously planted to a resistant variety. Isolates from the barley-producing areas of the USA differed significantly and consistently in cultural morphology and response to hydrogen-ion concentration from isolates from the flue-cured area and it is suggested that two distinct strains occur.

3263 Stephen, R. C.
Resistance to *Cercospora nicotianae* in the genus Nicotiana.
Emp. J. exp. Agric. 1958 : **26** : No. 101 : 70–75.

No completely resistant material was found in S. Rhodesia among 131 lines of *N. tabacum* nor in twelve wild species, although small differences in degree of infection were found among the different varieties. Varietal reaction is influenced by date of planting, Gold Dollar and White Stem Orinoco showing below-average infection and Virginia Gold, Delcrest and Hicks above average infection in early plantings.

3264 Schmelzer, K. & Klinkowski, M.
Ein neuer Stamm des Tabakrippenbräune-Virus in Mitteldeutschland. (**A new race of the tobacco brown vein virus in central Germany**).
Naturwissenschaften 1958 : **45** : p. 62.

A race attacking tobacco varieties hitherto immune to the above virus was isolated at Dresden [cf. XXVII, 3327]. The new race is designated Wi.

3265 Scarascia, G. T.
Effetti morfologici e mutativi dell'invecchiamento del seme in *Nicotiana tabacum* L. (**Morphological and mutational effects of aging in seeds of *N. tabacum* L.**).
Tabacco, Roma 1957 : **61** : 270–90.

A table is included giving the percentage of cells showing mitotic abnormalities in seedling root tips of four varieties grown from seeds from one to six years old. Some evidence for increase of abnormalities with age was obtained.

3266 **Annual report for the year 1956.**
Bull. Tea Res. Inst. Ceylon 1957 : No. 38 : Pp. 68.

Clonal selection continued. No consistent relationship was detected between the average yield of tea clones and their percentage of flush shoots per pluck during one yield cycle. Clonal yield and the time taken for a bud to develop into a pluckable shoot were only weakly correlated. Clones apparently tolerant of eelworm are undergoing test on estates. Pollen stored in desiccators at 40% relative humidity and 0°–2° C. maintained its viability for at least 5 months.

3267 Harada, K. & Matsuura, O.
(**Studies on the somatic chromosomes of the tea plant, using an improved squash method**).
Chagyo Kenkyu Hokoku/Tea Res. J. 1957 : No. 9 : 1–3. [Japanese].

A technique involving maceration of leaf tips in HCl, immersion in chromo-acetic acid and then in ammonia alcohol and finally squashing in acetocarmine is described.

3268 YOKOYAMA, S. & MATSUI, H.
(On the induction of polyploidy in the tea plant. The influence of secondary conditions during colchicine treatment on the occurrence of tetraploidy).
Chagyo Kenkyu Hokoku/Tea Res. J. 1957 : No. 9 : 8–11. [Japanese].

The optimum conditions for inducing polyploidy included the use of a 0·3% colchicine solution for 180–240 hr. Better results were obtained when the temperature fluctuated over a fairly wide range than when it remained relatively constant.

3269 ISHIGAKI, K. & KAWAI, S.
(The molybdenum content of tea leaves).
Chagyo Kenkyu Hokoku/Tea Res. J. 1957 : No. 9 : 75–78. [Japanese].

Data are included on the molybdenum content of the leaves of some Japanese varieties.

3270 TOMO, N., FUCHINOUE, Y. & FUCHINOUE, H.
(On the absorption of dyes by tea-plant tissues).
Chagyo Kenkyu Hokoku/Tea Res. J. 1957 : No. 9 : 11–15. [Japanese].

[Cf. XXVII, 3334].

3271 MATINJAN, A. B.
(Breeding the tea plant in the USSR).
Priroda (Nature), Leningrad 1958 : No. 1 : 104–08. [Russian].

This report on breeding *Thea* at Čakvi includes descriptions of three kinds of hybrid populations, mostly between Indian and Chinese strains. Populations 1, 2, 3, Uroža jnyj [Productive], Kangra Selekcionnyj [Improved Kangra] and 15 are distinguished by large leaf and high quality and exemplify the southern hybrids; these can be grown in all districts where the winter temperatures never fall below −8° C. Somewhat hardier than these are China-type hybrids such as Krupnolistnyj Kitajskij [Large-leaf Chinese], Kimyn' Selekcionnyj [Improved Kimyn'] and Zugdidskij Krupnolistnyj; they all outyield commercial strains and produce larger leaves of superior quality. Hardier still are populations with a medium-sized leaf; among these is variety 8, which was bred from a Japanese type of tea. It is outstandingly hardy, outyields commercial strains and produces leaf of better quality.

3272 SILVA, J. G. DA
O café "Mundo Novo". **(Mundo Novo coffee).**
Bol. Suptda. Serv. Café, S. Paulo 1957 : **32** : No. 367 : 13–19.

The Mundo Novo coffee, considered to be a hybrid between Sumatra and Bourbon [cf. XXIV, 1334 and 2326], though it has more of the characters of the Bourbon parent, is very heterogeneous in type and for this reason, combined with its tendency to produce empty seeds [cf. XXVII, 2100–3], Brazilian growers are urged to use only the selected seeds produced by the experimental station at Campinas, which give rise to perfectly uniform seedlings. The characteristics of this coffee, which bears more regularly than others grown in Brazil, are described. It has exceeded nine other varieties, including Bourbon Vermelho [Red Bourbon], Bourbon Amarelo [Yellow Bourbon] and Caturra, in yield tests over a ten-year period, the excess over Bourbon Vermilho amounting to 50% and more. The mean yield per tree varies from 13·1 kg. to 18·8 kg. in different progenies in the period 1951–56, the best progeny having yielded 4·6 kg. of berries per annum compared with the mean of 2·9 kg.; only 3% of its fruits had empty locules, the average for the selected progenies tested being 20% and that for unselected 50%. Figures are given showing that the use of selected seed could give an additional yield of 480 bags of 40 kg. of selected coffee from a plantation of 100,000 trees. Instructions are given for the most successful way of growing Mundo Novo coffee.

3273 **Annual Report of the West African Cocoa Research Institute 1956-57 :** Pp. 93.

At Tafo, Ghana, studies on the classification and comparison of virus isolates from Ghana and Nigeria have continued, as have investigations on the resistance and tolerance of Iquitos type T17 seedlings to the New Juaben virus. No evidence of marked resistance was found but it appears that highly tolerant plants contain little available virus for transmission by insect vectors. Preliminary tests indicate that isolates of *Phytophthora palmivora* from Nigeria differ from those from Ghana. It has now been shown that midges of the family Ceratopogonidae are the principal agents in natural pollination of cacao flowers and that stylar pollination is more effective in causing setting than pollination on the stigma. Details are given of the performance of Trinidad introductions, Upper-Amazon selections, local hybrid selections and trials in Ghana and Nigeria.

At the Ibadan substation detailed studies of Nigerian isolates of cacao viruses are in progress.

3274 Cope, F. W.
Incompatibility in *Theobroma cacao.*
Nature 1958 : **181** : p. 279.

Knight and Rogers have postulated the occurrence of five alleles at a single locus for incompatibility, with a sequence in dominance of $S_1 > S_2 = S_3 > S_4 > S_5$ [XXIV, 543 and XXV, 3318]. Their criterion of compatibility and incompatibility was the retention or fall, respectively, of hand-pollinated flowers protected from insect visits. Using some of the trees studied by Knight and Rogers, the present writer has instead examined the pollinated ovaries microscopically. In all cases of self and cross incompatibility, a proportion of fertilized ovules shows nonfusion between the egg nucleus and first ♂ gamete and between the polar nuclei and second ♂ gamete; the remaining ovules show normal fusion. Three main types of self-incompatible tree may thus be recognized, in which the proportion of nonfusion ovules is respectively (1) 25%, (2) 50% and (3) close to or actually 100%. All genotypes representing a combination of one allele and another recessive to it, such as $S_{1 \cdot 2}$, $S_{2 \cdot 5}$ or $S_{3 \cdot 4}$, gave, on self pollination, 25% nonfusion ovules. The genotype $S_{2 \cdot 3}$, when selfed, produced 50% nonfusion ovules. The expected 100% of nonfusion ovules was not however obtained by selfing $S_{5 \cdot 5}$, 25% being formed instead. The genotype may therefore be a combination of S_5 and a second allele, S_6, recessive to it. Cross pollination between genotypes carrying a dominant allele in common, e.g. $S_{2 \cdot 3}$ x $S_{2 \cdot 5}$, had 25% nonfusion ovules. The cross $S_{2 \cdot 3}$ x $S_{3 \cdot 4}$, found by Knight and Rogers to be incompatible, also resulted in 25% nonfusion ovules. All combinations not involving the same dominant allele in the sequence, e.g. $S_{1 \cdot 2}$ x $S_{2 \cdot 5}$ and $S_{1 \cdot 2}$ x $S_{3 \cdot 4}$, and those not involving a duplication of alleles of equal dominance, e.g. $S_{2 \cdot 5}$ x $S_{3 \cdot 4}$, produced only normal ovules. The data further indicated that incompatibility is sporophytically controlled. The author postulates that incompatibility is conditioned by two independent loci, *P* for the production of an incompatibility precursor and *S* which imparts specificity to the precursor. *P* shows simple dominance and acts before meiosis, whereas *S* is multiallelic and acts after meiosis. According to this hypothesis, three main self-compatible genotypes may be found: (1) *pp* $S_{\mathfrak{a}.\mathfrak{b}}$, self compatible because of lack of precursor, (2) *PP* $S_{\mathfrak{f}.\mathfrak{f}}$, self compatible as the result of homozygosity at *S*, and *pp* $S_{\mathfrak{f}.\mathfrak{f}}$, self compatible because both loci are inoperative. A cross between (1), believed to be representative of Central-American self-compatible trees, and (2), regarded as the genotype of self-compatible Trinidad cacao, should give offspring which are all self incompatible as the result of the active condition of both loci. Such offspring have been obtained.

3275 Tollenaar, D.
Zink als stimulans voor vruchtzetting bij cacao. (**Zinc as a stimulant of fruit setting in cacao**).
Bergcultures 1957 : **26** : 621–23.

Spraying young clonal trees on the Clementina estate, Ecuador, with the zinc fungicide Dithane at intervals of 15 days or one month resulted in a 20% higher total pod set although no effect upon the incidence of disease was observed.

3276 Popov, M. G.
(**On the relationships and the history of *Papaver* and *Roemeria***).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 1389–97. [Russian].

In a posthumous article evidence is presented for concluding that within the Papaveraceae the tribe Platystemoneae, with colourless sap, is the most primitive and the Papavereae the most advanced. The plexus *Papaver-Roemeria* is thought to have evolved, without hybridization, in the ancient Mediterranean area, where migrants from the east found a set of ecological conditions particularly favourable for speciation.

3277 Kopp, E.
Versuche zur Züchtung einer morphinreichen Mohnsorte. (**Experiments on breeding a poppy variety rich in morphine**).
Pharmazie 1957 : **12** : 614–20.

In studies conducted in Rumania, wide differences in morphine content of the capsules were found, both high and low content being heritable. Plants with large, pear-shaped capsules and blue seeds generally yielded most morphine per capsule. Morphine content was subject to wide environmental fluctuations.

3278 Davis, E. L.
Morphological complexes in hops (*Humulus lupulus* L.) with special reference to the American race.
Ann. Mo. bot. Gdn. 1957 : **44** : 271–94.

A method of measuring hop variation, based on examination of the leaves and cones, is described. Its application to collections of cultivated hops, brewing samples and herbarium material has indicated that the characters measured are stable for each variety over a wide geographical range. Cultivated hops were found to fall into three morphological complexes, respectively consisting of English varieties, Czechoslovakian varieties and the American hop Late Clusters. The presumably wild hops of the USA have characters in common with both Late Clusters and the wild hops of Japan but not with European hops. This finding is in agreement with Ono's discovery of the Sinoto type of sex-chromosome complex in American and Japanese wild hops but not among European ones. The view is, however, expressed that it is not as yet possible on morphological grounds to distinguish the truly native American hop from European hops. Application of the name *Humulus lupulus* to all perennial hops, pending a more thorough investigation of the native American hop, is therefore advocated. [XXVII, 3349].

MINOR CROP PLANTS

3279 Smith, P. G. & Heiser, C. B. (Jun.)
Breeding behavior of cultivated peppers.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 286–90.

Capsicum annuum, *C. frutescens*, *C. pendulum*, *C. pubescens* and *C. sinense* are known to have been brought into cultivation in the Americas in pre-Columbian times. A table is given summarizing the principal morphological characteristics of the five species, all of which have $n = 12$. Viable seed has been easily obtained from *C. annuum* x *C. sinense* and *C. frutescens* x *C. pendulum*. Many viable F_2 and back-cross seeds have been secured from the former cross; the F_1 and back crosses of the latter combination have been less productive of viable seed. *C. annuum* x *C. frutescens* and *C. frutescens* x *C. sinense* have yielded a few viable F_1, F_2 and back-cross seeds. Only F_1 plants have been obtained from *C. sinense* x *C. pendulum*. Success has been gained in raising F_1 individuals of *C. annuum* x *C. pendulum* and *C. sinense* x *C. pubescens* by culture of partially-developed embryos. An occasional F_2 plant has been obtained from the former of these two combinations. The crosses *C. annuum* x *C. pubescens*, *C. frutescens* x *C. pubescens* and *C. pendulum* x *C. pubescens* were unsuccessful. In the case of the compatible crosses, success or failure depended on the direction of the cross or, when the cross was compatible in both directions, reciprocal differences were found in fertility. The results of hybridization also differed according to the parental varieties used.

3280 Smith, P. G. & Heiser, C. B. (Jun.)
Taxonomy of *Capsicum sinense* Jacq. and the geographic distribution of the cultivated *Capsicum* species.
Bull. Torrey bot. Cl. 1957 : **84** : 413–20.

The existence of the above species in addition to the cultivated species previously described [XXIV, 1356] is confirmed and an amended description of it is provided. Crosses between *C. sinense* on the one hand and *C. frutescens* and *C. annuum* on the other yielded F_1 and F_2 progeny which were partially or completely sterile. Maps are included showing the distribution in Central and South America, Mexico and the West Indies of the five cultivated *Capsicum* species.

3281 Dolan, D. D.
Pepper introductions—how do they rate?
Bull. NY St. agric. Exp. Sta. 1957 : **23** : No. 4 : 10–11.

The criteria used in the evaluation of new introductions at the Northeast Region Plant Introduction Station, USDA, are discussed and ten of the most promising recent introductions are described, two from Georgia and eight from Turkey.

3282 Revilla, V. A. & Corrales M., A.
Ensayo comparativo de resistencia al wilt del ají. (**Comparative trial of wilt resistance in *Capsicum***).
Bol. Estac. exp. agríc. La Molina 1957 : **31** : No. 362 : 10–14.

In comparisons of the Chilean variety Crystal with three local varieties at La Molina, Peru, the highest yield was given by Escabeche de Moquegua [Moquegua Pickling] and the lowest incidence of *Fusarium annuum* was shown by Escabeche de Lurín [Lurín Pickling] followed by Crystal.

3283 Crossan, D. F. & Rahn, E. M.
The development and evaluation of resistant pepper varieties and selections by means of artificial inoculation in the field with tobacco mosaic virus.
Plant Dis. Reptr. 1958 : **42** : 48–50.

In a test at the Delaware University Substation, Georgetown, Yolo Wonder A, Keystone Resistant Giant and a selection provisionally named Caldel were homozygous for a high degree of resistance to tobacco mosaic virus. Improved

Yolo and another new selection tentatively named Calcom were also highly resistant but not homozygous for this character. Keystone Resistant Giant and Caldel were outstanding in plant uniformity, yield, fruit shape and fruit-wall thickness. Caldel had the added advantage of large, broad leaves which reduce damage from sun scald.

3284 Boev, N. D. & Negrobova, F. I.
(New standard varieties of oil plants).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 5 : 39–43. [Russian].

Poppy. Novinka 198 [Novelty 198] was selected in the Ukraine from a local form in the Har'kov province; it is rich in oil, has a higher morphine yield than Voronež 1042 and is suitable for combine harvesting. Descriptions are given of the new varieties Prževal'sk 222, Prževal'sk 133 and Tien Shan 203 from Kirgizia; all three have high morphine contents, Prževal'sk 222 being 9–14 days earlier than the standard Tien Shan 27 and the other two exceeding it in yield.
Swede-rape. The new winter variety Nemerčansk 1 was selected from local material at Vinnica; it outyields the standard Černjahovskij Mestnyj [Local Černjahov] in the province of Žitomir and has a 1·5% higher oil content.
Sunflower. Jugovostočnyj [South-eastern] (VNIIMK 1646 [Oil Plants Institute 1646] x Saratov 27) was bred at Saratov and Armavir 9343 was selected at Armavir. The former outyields Saratov 169 by 1·5 c. per ha. in the provinces of Kujbyšev and Čkalov and has a 4·5–6·5% higher oil content. The other ripens 6–8 days earlier than Armavir 3497 and is richer in oil than most late varieties in the territories of Stavropol' and Krasnodar. It is characterized by uniform maturity and resistance to *Orobanche* and fair resistance to *Homeosoma nebulella*. Mention is made of some older varieties resistant to *Orobanche* and with a 4–7% higher oil content than Ždanov 8281 and other varieties.

3285 Kartha, A. R. S. & Sethi, A. S.
A cold percolation method for rapid gravimetric estimation of oil in small quantities of oil seeds.
Indian J. agric. Sci. 1957 : **27** : 211–17.

Further work at the Indian Agricultural Research Institute, New Delhi, has resulted in the development of a method which makes possible the determination of the oil content of 0·1–0·3 g. of seed in about 1½ hr. [cf. XXV, 3325]. The sample is pulverized with glass powder and anhydrous Na_2SO_4. The mixture is percolated with petroleum ether into dishes containing 4 sq. in. of filter paper. This solvent is then evaporated in an oven at 95–100° C. for 20–50 min.

3286 Patil, J. A., Chavan, V. M. & Chaudhari, B. B.
Improved variety of niger for Bombay Deccan.
Indian Oilseeds J. 1958 : **2** : 1–4.

Two selections of *Guizotia abyssinica*, made at the Agricultural Research Station, Niphad, from material collected in various districts in Bombay Deccan and subjected to individual plant selection, selfing and mass selection, are to be distributed as N–12–3 and N–13–2. Both have performed better than local strains and the research station's improved strain B in trials in Nasik and Ahmednagar districts.

3287 Gursham Singh, Nirmal Singh & Kuldip Singh Lobana.
Utility of polycross technique in *Brassica* improvement.
Indian Oilseeds J. 1958 : **2** : 31–32.

Polycross progeny from 16 promising inbreds of sarson were tested in 1956–7 against Brown Sarson selection A (BSA) at Gurgaon, Punjab. Six outyielded BSA, the greatest increase being one of 20% in the case of progeny from the inbred P75–1–2–4 from Mewat. The use of the polycross technique, suitably modified, is recommended for the improvement of self-sterile forms of *Brassica* crops.

3288 Singh, D. & Singh, D. N.
Improved varieties of yellow sarson in Uttar Pradesh.
Indian Oilseeds J. 1957 : **1** : 330–34.

Three selections from samples collected in the Barabanki, Kanpur and Aligarh districts have shown improved agronomic characters and higher yield and oil content as compared with local varieties and are to be distributed as Type 1 (T1), Type 10 (T10) and Type 151 (T151) respectively. T1 is tall and has a profuse branching habit and although the seeds are small they have a high oil content and are late in maturing. T10 is rather earlier in maturity and performs better than T1 on light soils with low rainfall. T151 is tall, with profuse branching and is especially suitable for mixed cropping with wheat in the western districts. The seeds are large and are late in maturing.

3289 MANNER, R.
Studies in winter rape (*Brassica napus oleifera*. 1. Parent-progeny correlations.
Medd. Gullåk. VäxtförädlAnst. 1957 : No. 14 : 45–56.

Preliminary studies of winter rape lines in 1950–52 indicated that parent-progeny correlations were greater for seed yield, flowering date and 1000-seed weight than for plant density in spring, winter mortality rate and plant height. Further studies of seed characters in 1952–56 showed wide yearly differences in correlation coefficients for seed yield, oil content, oil yield and 1000-seed weight, indicating a marked environmental effect. It is estimated that about 15% of the total variation in seed yield, oil yield and 1000-seed weight of one generation is found in the progeny, the corresponding percentage for oil content being about 20. The average percentage for all characters was greatest between parent and immediate progeny and decreased between more distant generations.

3290 MANNER, R.
Studies in winter rape (*Brassica napus oleifera*). II. Correlations between different characters.
Medd. Gullåk. VäxtförädlAnst. 1957 : No. 14 : 61–94.

In studies of Lembke, Regal and Matador, plant density in spring was positively and significantly correlated with plant height and seed yield; plant height with stalk stiffness and seed yield; seed yield with moisture content; 1000-seed weight, determined only in Regal, with darkness of seed colour and moisture content; and percentage loss of material during threshing, also studied only in Regal, with stalk stiffness. Correlations between plant density in spring and winter mortality rate and between date of flowering and seed yield were negative, while correlations of plant density during autumn with plant density during spring, plant height, winter mortality, and seed yield, of plant height with winter mortality and of stalk stiffness with seed yield varied in sign according to variety.

3291 HOFFMANN, W. & PETERS, R.
Versuche zur Herstellung synthetischer und semisynthetischer Rapsformen. **(Attempts at producing synthetic and semisynthetic forms of rape).**
Züchter 1958 : **28** : 41–51.

At Hohenthurm, Germany, synthetic and semisynthetic forms of *Brassica napus* ($2n = 38$) were obtained in the following ways: (1) colchicine treatment of F_1 hybrids from the cross *B. rapa* x *B. oleracea* and its reciprocal; (2) union of unreduced gametes by selfing the *B. rapa* x *B. oleracea* hybrids; (3) *B. rapa* ($4n$) x *B. oleracea* ($4n$); (4) colchicine treatment of *B. napus* x *B. rapa* hybrids to give *B. naporapa* ($2n = 58$) and pollination of *B. naporapa* by *B. oleracea*; (5) colchicine treatment of *B. napus* x *B. oleracea* hybrids to give *B. napoleracea* ($2n = 56$) and pollination of *B. napoleracea* by *B. rapa*; (6) the unreduced gametes from the cross *B. napus* x *B. oleracea* are fertilized by *B. rapa* (♂) and (7) the unreduced gametes from the cross *B. napus* x *B. rapa* are fertilized by *B. oleracea* (♂). Several varieties of *B. napus*, *B. rapa* and *B. oleracea* were used in these crosses. It is thought that methods (4), (5), (6) and (7) have not been used successfully before. Seed from many of the crosses gave forms resembling the mother plant; forms of *B. napoleracea* had the least tendency to matrocliny. These synthetics and semisynthetics all resembled one another closely and did not differ markedly from naturally occurring forms of *B. napus*; they were fertile and could be crossed with one another and with the natural forms. The fertility of the amphidiploids, *B. naporapa* and *B. napoleracea*, was lower than that of the diploids, but the amphidiploids had a high 1000-seed weight. Some of these new forms of rape were found to have useful agronomic characters.

3292 MANNER, R.
Hammenhögs original Vestal höstraps. **(The original Hammenhög winter rape Vestal).**
Medd. Gullåk. VäxtförädlAnst. 1957 : No. 14 : 57–60.

In state trials and in tests at Gullåker, Sweden, Vestal has continued to exceed Margo, Matador and Regal in yield of both seed and oil [cf. XXVI, 2718] and has also shown the highest rate of winter survival.

3293 BONNEMAISON, L.
Le charançon des siliques (*Ceuthorrhynchus assimilis* Payk). Biologie et méthodes de lutte. **(*C. assimilis* Payk. Biology and methods of control).**
Ann. Inst. nat. Rech. agron., Paris : Ser. C. : 1957 : **8** : 387–543.

To control the reproduction of *C. assimilis* on winter rape, the creation of varieties of rape with a short and late flowering-period is recommended; such varieties would produce their seed after the egg-laying period of *C. assimilis*.

3294 JOGLEKAR, R. G. & DESHMUKH, N. Y.
A short note on inheritance in castor.
Nagpur agric. Coll. Mag. 1956–57 : **31** : 18–19.

Monogenic inheritance has been found in

respect of red stem *vs.* green stem and blossoming *vs.* nonblossoming in the cross EC2848 x EB16, red stem and blossoming being dominant. A wide range of segregation was found with respect to period of maturity.

3295 Moškin, V. A.
(VNIIMK 165, a castor variety for mechanized harvesting).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 5 : 49–51. [Russian].

Multiple hybridization involving four unnamed subspecies of *Ricinus* is reported from Krasnodar. Among the new varieties thus obtained is VNIIMK 165 [Oil Plants Institute 165] which was made a standard for the Krasnodar territory in 1956. It exceeds the older varieties such as Sanguineus 401 in seed and oil yield per unit area, ripens 4–5 days earlier, sheds 70–75% of its leaves on reaching harvest maturity and develops 90–95% of its fruit clusters on the main stem, 50–60 cm. above the ground. This habit makes it suitable for combine harvesting and, in view of the small number of fruit clusters borne on the laterals, obviates ripening off.

3296 Giard, J.
Le ricin dans l'Union Française. (**The castor oil plant in the French Union**).
Oléagineux 1958 : **13** : 263–67.

Ouidah 6, a new variety bred at Dahomey in West Africa, yields well and is suitable for machine shelling. The breeding in progress at Dahomey includes crossing Ouidah 6 or varieties from the Belgian Congo adapted to the local climate with varieties from Indochina and Morocco.

3297 Mazzani, B.
Híbridos entre sésamos tetraploides dehiscentes e indehiscentes. II. Efecto de dosis del gen *id*. (**Hybrids between dehiscent and indehiscent tetraploid sesame. II. Effect of dose of the gene *id***).
Agron. trop., Venezuela 1957 : **7** : 19–22.

Comparisons of the F_3 segregations of crosses of the above type confirmed the supposition that the F_2 comprises three phenotypic classes of the following constitution: (1) indehiscent, quadriplex for *id*; (2) intermediate, triplex for *id*; and (3) normal, with two doses of *id* or less.

3298 Comstock, V. E. & Culbertson, J. O.
A rapid method of determining the oil content of the seed and iodine values of the oil from small samples of flaxseed.
Agron. J. 1958 : **50** : 113–14.

Details are given of a method developed at the Minnesota Agricultural Experiment Station for determining the iodine value and oil content of 1 g. samples of seed. The method involves removal of about 70% of the oil by pressing, followed by extraction by a petroleum-naphtha solvent. After drying, the seed residue is weighed, loss in weight being attributed to the weight of oil removed by both processes. Iodine value is determined by refractometric examination of the oil expelled by pressing.

3299 Asthana, R. P.
Incidence of wilt disease (on *Linum usitatissimum* in M.P.).
Nagpur agric. Coll. Mag. 1956–57 : **31** : 16–17.

Of 13 varieties tested under field conditions at Nagpur, ST6 showed the least incidence of *Fusarium* wilt.

3300 Kováčik, A.
Poznámky zo študijnej cesty v Bulharsku. (**Notes on a study tour of Bulgaria**).
Pol'nohospodárstvo 1957 : **4** : 595–600.

Mention is made of wide vegetative and sexual hybridization of the sunflower in Bulgaria to obtain forms resistant to *Puccinia* and *Orobanche*. *Helianthus tuberosus*, *H. rigidus*, *H. decapitatus*, *H. latiflorus*, *Xanthium italicum*, *X. echinatum*, *X. canadense* and *X. strumarium* are among the distantly related species being employed.

3301 Georgieva-Todorova, J.
(Experiments on overcoming incompatibility between *Helianthus annuus* and *H. tuberosus*).
Izv. Inst. Rastenievädstvo (News Inst. Pl.-Industr.), Sofia 1957 : No. 4 : 147–61. [Bulgarian].

Incompatibility between the sunflower and Jerusalem artichoke was overcome by the use of vegetative rapprochement at the Bulgarian Institute of Plant Industry. The F_1 from 3–18 sunflower/*H. tuberosus* ♀ x *H. tuberosus* ♂ showed great variability, in particular with regard to mode of branching. Some F_1 plants showed resistance to *Orobanche*, formed heads 20–30 cm. in diameter and had a higher oil content than 3–18.

3302 Šimanskij, N. K.
(Intervarietal crossing of the sunflower).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 5 : 66–67. [Russian].

Experiments on pollinations of sunflowers with pollen mixtures at Odessa showed that most progeny were maternal types, even if the seed parent was emasculated. An increased proportion of uniformly maternal types occurred among progenies where the mother plant was supplementarily pollinated with mixed pollen, especially if supplementary pollinations were carried out as often as 4 or 5 times. This treatment also improved the yield and oil content, the efficacy again varying with the number of pollinations. It was found that more vigorous material was obtained when the plants were pollinated not later than the second day after anthesis and the pollen was fresh or stored for not more than 5 days.

3303 ARGIKAR, G. P. & SALANKI, M. S.
A study of growth habits in safflower (*Carthamus tinctorius* L.).
Indian Oilseeds J. 1958 : **2** : 13–17.

Tabulated data are included on plant height and number of branches at five dates between 13 November 1952 and 29 December 1952, days to flowering, plant height and number of fruiting branches on 11 January 1953 and final plant height and spread of 26 varieties grown at the Agricultural Research Station, Bijapur, Bombay State. High positive correlations were found between plant height and number of branches and between mean girth of stem at maturity and yield. Early flowering was generally correlated with early maturity [cf. 856].

3304 NISHIKAWA, G., MIKAMI, T. & KURODA, S.
(Studies on the morphology and development of safflower, *Carthamus tinctorius* L.).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : 51–52. [Japanese].

Three varieties were studied and varietal differences were noted in habit, vegetative period, number of bracts, spininess of bracts and oil content. High oil content was associated with yellow rather than red flowers.

3305 PATIL, J. A. & CHAVAN, V. M.
Selfing methods in safflower (*Carthamus tinctorius* L.).
Indian Oilseeds J. 1958 : **2** : 10–12.

Temperature and humidity were found to have a considerable effect on seed setting in safflower, bagged inflorescences setting few seeds as compared with those not bagged. Muslin bags, which allow some air movement and thus prevent too great a rise in temperature and humidity, gave the best seed set but good results were also obtained with pierced newspaper bags, which have the additional advantage of cheapness. The visits of pollinating insects did not appear to be necessary.

3306 DESNEUX, R.
Prospection des palmeraies et sélection du palmier à huile au Kwango. **(Surveying the palm groves and oil-palm breeding at Kwango).**
Bull. INÉAC 1957 : **6** : 351–64.

Criteria used in selecting breeding material at Kwango are discussed; the climatic conditions are rather unfavourable to oil palms and it is important to select locally-adapted types. The characteristics of some promising *tenera*, *dura* and *pisifera* types selected at Yangambi are given. A breeding programme, which is to include crosses between promising local types and material from Yangambi, is outlined.

3307 **Fifth Annual Report of the West African Institute for Oil Palm Research 1956-57** : Pp. 132.

Seedlings from *tenera* x *pisifera*, *tenera* x dumpy Deli E 206–1.1, *dura* x *dura* and *tenera* x *tenera* have been planted out at the main station for field trials together with some from the first cross at two localities in Ghana and some from the latter two crosses at the Abak substation. The making of crosses between the best *tenera* palms, on behalf of the National Institute of Agricultural Research in the Belgian Congo, and between high-yielding *dura* and *tenera* palms, on behalf of the Institute for Research on Oils and Oil-bearing Plants, has been initiated. Studies of the determination of fruit form in crosses among *dura*, *pisifera* and *tenera* forms have continued.

Four palms grown from open-pollinated seed of an *albescens* palm at Akwukwu produce fruit having the external appearance of the *albescens* type but giving darker oil. Crossing between palms in this progeny has been carried out with a view to obtaining some pure *albescens* palms. The Nigerian Deli strains have continued to maintain their general superiority over Malayan strains but one Malayan strain, Deli 19 x 65, has consistently given high yields and in 1956 gave 14,000 lb. of fruit bunches per acre.

3308 YAMPOLSKY, C.
Some aspects of the oil palm in Indonesia.
Econ. Bot. 1957 : **11** : 208–24.

It is suggested that the forms known as *dura*, *semidura* and *tenera*, which are described and illustrated here, are sufficiently distinct and of sufficient genetical stability to warrant botanical recognition. The *pisifera* and diwakawaka types are also described.

3309 Khoshoo, T. N. & Sobti, S. N.
Cytology of Indian species of *Artemisia*.
Nature, Lond. 1958 : **181** : 853–54.

The following chromosome numbers are reported: *A. vulgaris* from Germany and *A. scoparia*, $2n = 16$; *A. laciniata*, *A. parviflora*, *A. tournefortiana* and *A. vestita*, $2n = 18$; *A. vulgaris* from India, $n = 18$ and 27; *A. absinthium* and *Artemisia* sp. $n = 9$; *A. glauca*, $2n = 36$; *A. maritima* from Japan and Kashmir, $n = 27$ and 18 respectively; and *A. roxburghiana*, $2n = 18$ and 36. Since the Indian form designated *A. vulgaris* involves a basic chromosome number of 9 and not 8 as in *A. vulgaris* from northern Europe, the former complex requires taxonomic analysis. Indian *A. vulgaris* is also interesting phytogeographically. Diploids have been found only in the innermost Himalayas in regions of past or present glaciation. In the outer Himalayas tetraploids are preponderant. In addition, hexaploids appear at the lower altitudes, as well as in valleys between the outer Himalayan foothills and the Siwalik ranges. The hexaploid type has also spread to the Nilgiri Hills in southern India, in all probability by way of Mount Abu.

3310 Vodopivec, S., Sivev, S. & Tomažič, G.
O santoninu iz jadranskega morskega pelina, *Artemisia caerulescens* L. (**Santonin from *A. caerulescens* L.**).
Nove proizvodnje, Ljubljana 1953 : Pp. 44.

Twelve types of *A. caerulescens*, differing markedly in morphological characters and santonin content are illustrated. The taxonomic status of these forms is being determined and selection for high santonin content is in progress.

3311 D'Amato, F.
Revisione citosistematica del genere *Colchicum*. III: *C. alpinum* Lam. et DC., *C. Cupanii* Guss., *C. Bivonae* Guss. e chiave analitica per la determinazione delle specie di *Colchicum* della flora italiana. (**Cytosystematic revision of the genus *Colchicum*. III. *C. alpinum* Lam et DC., *C. Cupanii* Guss., *C. Bivonae* Guss. and an analytical key for the determination of the species of *Colchicum* in the Italian flora**).
Caryologia 1957 : **10** : 111–51.

The first two species were found to have $2n = 54$ and the third $2n = 52$. A map showing their geographical distribution is provided, together with detailed lists of localities and a brief description of each. The dichotomous key provides only for the identification of these three species and the three previously described [XXVI, 58 and XXVII, 4286] although it is thought that two further species, hitherto undescribed, occur in Italy [3312]. Evidence is presented that *C. todarii* and *C. tenorii* are synonyms of *C. cilicium*, a sterile species sometimes found as a garden escape in southern Italy.

3312 D'Amato, F. & Chiarugi, A.
Attuali conoscenze sulla citotassonomia del genere "Colchicum". (**Present knowledge on the cytotaxonomy of the genus *Colchicum***).
RC Accad. Lincei : Ser. 8 : 1956 : **20** : 632–38.

Information on the geographical distribution and chromosome number of 18 species is summarized in the form of a table. All the species so far studied appear perfectly stable, with no evidence of the differentiation of biotypes by polyploidy or aneuploidy although the occurrence of basic chromosome numbers of 8, 9 and 10 is taken to indicate the importance of amphidiploidy in speciation in this genus. The possibility of interspecific hybridization occurring naturally in localities where more than one species occurs is under investigation; an unnamed species from Parma and N. Africa is thought to be a naturally occurring hybrid between *C. lusitanum* and a 38 or 40 chromosome species. Two centres of origin of new species are suggested, an eastern Mediterranean and Eurasiatic region and a central-western Mediterranean region. [Cf. XXVI, 58; XXVII, 4286 and XXVIII, 3311].

3313 **RRIM "600" clones—second series.**
RRI Plant. Bull. 1958 : No. 34 : 22–24.

Data obtained on the growth, yield and bark thickness of the rubber clones RRIM 619–630 at the Sungai Buloh Station, Malaya, are presented. RRIM623 (PB49 x Pil B84) merits addition to the list of promising clones [cf. XXVII, 4289] on account of its vigour, yielding capacity, attractive growth habit and apparent resistance to wind damage.

3314 Lescano Alva, M.
Clones productores y resistentes a la SALD. (**Productive clones resistant to South American leaf disease**).
Bol. trimestr. Exp. agropec., Progr. coop. Exp. Agropec., Lima 1956 : **5** : No. 4 : 12–14.

Reference is made to material resistant to *Dothidella ulei* developed under the auspices of the Interamerican Cooperative Programme for

Rubber Cultivation. The clones yield almost as well as own-rooted oriental clones grown in uninfected areas and may surpass grafted oriental clones; in addition, they are resistant to wind and other damage. At Tingo María Agricultural Experimental Station, Peru, this material is undergoing further selection for resistance to *Pellicularia filamentosa*. Most of the high-yielding resistant clones derive from *Hevea brasiliensis* x *H. benthamiana* and are termed FX clones.

3315 Delhaye, R. J.
Activités des centres d'essais sur pyrèthre du Kivu-Nord et du Ruanda. (**Activities of the centres for testing pyrethrum in Kivu-Nord and Ruanda**).
Bull. INÉAC 1958 : **7** : 39–52.

Information is provided on the performance of the best clones selected at three centres in the above regions; clone 1353 has proved highly productive in respect of pyrethrins.

FRUITS AND NUTS

3316 Potter, J. M. S.
The national fruit trials.
Exp. Hort. 1957 : No. **1** : 12–16.

A general account is given of the work of the National Agricultural Advisory Service for England and Wales in testing, collecting and classifying varieties of fruits.

3317 **Horticultural Experiment Station and Products Laboratory. The first fifty years, 1906 to 1956.**
Bull. Ont. Dep. Agric. : Pp. 76.

The section of this report dealing with fruit and vegetable breeding lists and comments on fruit and vegetable varieties introduced and distributed by the station in the period under review.

3318 Brooks, R. M. & Olmo, H. P.
Register of new fruit and nut varieties. List 12.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 557–84.

A further annotated list of varieties of fruits and nuts introduced by official and commercial agencies in North America is provided [cf. XXVII, 4336].

3319 Brooks, R. M. & Olmo, H. P.
New fruit varieties.
Amer. Fruit Gr. 1958 : **78** : No. 1 : 30–31, 46–47, 49.

A descriptive list of fruit and nut varieties introduced in the United States, chiefly in 1957, is given.

Sokolov, S. Ja. (Editor).
(**Plant introduction and green belts**).
Trud. bot. Inst. Komarov (Trans. Komarov bot. Inst.) : Ser. VI : 1957 : No. 5 : Pp. 238. [Russian].

In consideration of the lack of general understanding on the basic principles of plant acclimatization in the USSR, the Botanical Institute of the Academy of Sciences organized a meeting on the subject in October 1953 and the present volume comprises the papers read at that meeting, together with the discussion.

3320 *Sokolov, S. Ja.* (*The present state of the theory of plant acclimatization and introduction*). (*pp. 9–32*).

The speaker gave an historical outline of the ideas on plant introduction and acclimatization in Russia and elsewhere, emphasizing the importance of principles enunciated by Darwin, Mičurin and others on inheritance and the influence of environmental conditions, and of selection operating on populations in which the hereditary constitution has been shattered as a result of changed environment. The successful introductions into the USSR are divided into two categories: those involving little or no change in hereditary constitution and those involving changes of growth rhythm or response to various ecological factors.

3321 *Griško, N. N.* (*Theoretical basis of plant acclimatization*). (*pp. 33–36*).

The work of Mičurin and a number of others is cited in illustration of the importance of distant hybridization in the successful acclimatization of tree species, marjoram, grape vines, peaches and other fruit trees, forage plants and ornamentals.

3322 *Rubin, V. A.* (*Laws of biochemical variation in plants in connexion with the problem of acclimatization*). (*pp. 50–58*).

The effects of rhythmic changes of factors such as temperature and light are discussed. Different species reacted differently when grown with a constant temperature of 23–25° C.; such conditions accelerated the completion of the growth cycle in northern races of vine and retarded it in southern races, which matured more rapidly in conditions where low night temperatures alternated with high day temperatures. Certain ecotypes of *Cosmos* only survived if the night temperature was below 17° C.

Several instances of diurnal or seasonal rhythms in various biological processes are cited. All are ascribed to the conditions under which the plant in question has evolved. The capacity of the sugar beet to synthesize sucrose under a wide range of temperatures, from 10° to 40° C., is thought to result from its origin by hybridization between leaf beets and beetroots, which come from very different ecological zones.

3323 *Vehov, N. K.* (*Methods of introduction and acclimatization of trees*). (*pp.* 93–106).

An outline is given of the methods of introduction and acclimatization of tree species employed in the Soviet Union. Marked differences in respect of cold resistance and other properties have been observed between specimens of different provenance in such species as *Juglans regia*, *Rhus cotinus* and *Robinia pseudoacacia*. They are mainly associated with differences in length of growing period and could serve as the basis of selection of adapted races. Although, in general, races of northerly provenance are the most hardy there were exceptions in the case of *J. nigra*, *Rh. cotinus*, *Platanus* sp. and others. Figures showing the variation between individuals within a population are also given: in 1935 a study of *J. nigra* and *J. cinerea* populations, in which the mean coefficients of winter hardiness were 55 and 87%, showed the coefficients to vary from 0 to 100%; the only difference between hardy and less hardy races was that the percentage of individuals that survived was higher in the former than the latter. Differences in the length of the growth period in different individuals amounted to 26 days in *J. cinerea*, 31 days in *J. regia* and 42 days in *J. nigra*. By selection from a small population of some 150 trees, six frost-resistant trees of *J. nigra* were obtained, five of which survived the severe winters of 1939–40 and 1941–42, with temperatures as low as — 41·4° C. In the same way a frost-resistant race of *Rh. cotinus* was selected and is being widely planted in the forest-steppe zone and also in the vicinity of Moscow.

The opinion is expressed that plant introduction should always be accompanied by selection carried out on seedlings grown in the area to which the species is to be introduced. Several examples of the successful application of this principle are given; thus pecans can be grown as far north as Kiev, *Acer negundo* in the central area of European Russia and lemons, tung, eucalyptus and *Acacia dealbata* on the Black Sea coast near the Caucasus. The importance of growing the seedlings under severe conditions for developing hardiness and under good conditions for developing latent qualities not expressed in the wild is emphasized. Experiments on a number of tree species have shown that purple leaves are heritable and are transmitted to 40–80% of the progeny in trees such as plane, barberry and apple; most other ornamental characters are transmitted to only 1–3% of the offspring but this proportion can be increased by isolation to encourage interpollination by which means many desirable characters such as dissected leaves can be fixed in the second or third generation. The heterosis in many wide hybrids of larch, poplar, walnut, oak, maple, lime, ash and other trees, observed in the Soviet Union, is said to confirm the principles established by Mičurin in his work with fruit trees, particularly the value of crosses between parents differing in geographical origin. Special mention is made of hybrids of *Larix sibirica* x *L. europaea*, *Juglans regia* x *J. cinerea* (the hybrid being named *J. silvostepposa*) and Mongolian x Crimean limes; hybrids of garden rhubarb with *Rheum tanguticum* having leaves up to 1 m. in length and petioles 5 cm. in thickness, have maintained their heterosis in the second generation and it is thought that the same may happen in heterotic tree hybrids. Not all wide crosses give such hybrids however and mention is made of a number of crosses of *Ptelea trifoliata* with *Phellodendron amurense* and other species, in all of which the progeny were entirely maternal in characters; the same was true in crosses of *Ph. amurense* with *P. trifoliata*, with wild rose and with other related species, all of which gave apomictic progeny.

Many wide hybrids, both sexual and vegetative, have been shown to have greater metabolic activity than the parent species.

3324 *Ščepot'ev, F. L.* (*Acclimatization of tree species by means of distant hybridization and directed training*). (*pp. 111–30*).

Reference was made to the work of Mičurin with fruit trees and of Sukačev with willows [XV, 285] and it is recorded that 90% of the willow hybrids display heterosis, 14 out of the 26 studied having shown an annual increase of over 3 m. in length, the maximum being 346 cm. Reference is also made to poplar hybrids produced by A. S. Jablokov [cf. 948 and 956], S. L. Bogdanov [XXV, 555], A. J. Žurbin [XXV, 556] and A. M. Berezin. The last-named author produced some very vigorous hybrids from crosses of *Populus nigra* with species from other sections of the genus; at the age of 3 years the best seedlings had attained a height of 4·6 m. and at 4 years 6·1 m.; no change in chromosome number was observed in the hybrids. Hybrids obtained by the speaker by crossing *P. tremula* x *P. turkestanica* have displayed several useful features; the first is named *P. wesjelobokowjensis* and is described as vigorous in growth, a 14-year old tree having a height of 10·2 m. and thickness of 30 cm. at the base and 18 cm. at breast height; a 7-year old tree was 3 m. high and the average rate of growth was 1 m. a year; the bark is smooth like the aspen, the leaves large, and rounded, up to 12 cm. in diameter; the species is highly resistant to drought and high temperatures and can be reproduced vegetatively. *P. sukaczewii*, a selection from the same cross, is described as having a narrow pyramidal crown, a height of 8·5 m. and trunk diameter of 16 cm. at the base and 11 cm. at breast height at the age of 14 years, smooth, rounded leaves and tolerance of conditions in the Ukrainian and more northerly steppes.

Mention is made of the oak hybrids produced by S. S. Pjatnickij [cf. XXVI, p. 711] and of interspecific birch hybrids obtained by V. A. Malin by grafting. By pollinating filbert varieties growing near Moscow, A. S. Jablokov has produced forms with good-quality nuts capable of growing in the Moscow region.

A. S. Jablokov has crossed *Juglans mandshurica* and *J. sieboldiana* with *J. regia* and *J. cinerea* and some of the hybrids are promising in rate of growth and in morphological and biological features; he has also made a number of intergeneric crosses [cf. 948]. Experiments of V. M. Rovskij have shown that sets of only 2·3% are obtainable in crosses of *J. regia* x *J. nigra*, whereas in crosses of *J. regia* with pecan a set of 5% is obtained and in intervarietal walnut crosses 14·8%. A. P. Ermolenko has produced more than 100 interspecific walnut hybrids, three of which are of particular interest and are described. Pervenec Ukrniilha [Ukrainian Firstborn] is a hybrid of *J. nigra* x *J. regia* and a 20-year old tree has attained a height of 5 m. and a diameter of 14 cm. at the base; the leaves, which are up to 50 cm. in length, are aromatic like the walnut. Zabytyj [Forgotten], a hybrid of *J. mandshurica* x *J. regia*, is 4 m. high at 14 years, with a diameter of 12 cm. at the base, and has aromatic leaves 55 cm. in length. Nahodka [Discovery], a hybrid of *J. regia* x *J. nigra*, is 3 m. high at 14 years, with a diameter of 7 cm. at the base, and also has aromatic leaves. All three hybrids are very winter hardy, though they are susceptible to late spring frosts. The author also reports the results of his own work on interspecific hybridization in walnuts. A study of natural populations shows an almost even distribution at any given moment of trees bearing male and trees bearing female flowers. Data are given on the time of flowering of the walnut in the Ukraine in the years 1934–1953; *J. mandshurica* and *J. cinerea* flower together with *J. regia* while *J. nigra* is about a week later. Pollination experiments revealed the existence of certain trees of *J. regia* which gave specially good results as pollinators and others with an unusual capacity for producing hybrids when pollinated with other species. By applying this knowledge it was possible to obtain as many as 80·9% of hybrid fruits in interpollinations of *J. regia* forms, 53·3% in crosses of *J. regia* x *J. mandshurica* and 50·0% in crosses of *J. regia* x *J. nigra*. Four different trees of *J. regia* when pollinated from the same flower of *J. nigra* gave respectively 37·6, 4·7, 3·3 and 2·1% of hybrid fruits, showing their different capacity for fertilization by this species. Conversely, when the female flowers of the same tree of *J. regia* were pollinated with pollen from four different trees of *J. nigra*, the proportions of hybrid fruits were respectively 0, 32·3, 50·0 and 37·6%; the first of the four trees was in a very low state of vitality owing to fungus attack. Pollination of two trees of *J. regia* with mixed pollen from several species increased the set by 50–100%. Thus the set of hybrid fruits with *J. mandshurica* alone was 23·7–53·3%, that from *J. cinerea* 28·0–32·2% and that from a mixture of the two 66·6%. Pollen of *J. regia* and *J. cinerea* gave 81·2% and *J. regia* + *J. mandshurica* gave 63·3%. In pollinations of *J. nigra* with other species better sets were obtained when several, say 7–8, flowers on the same branch were pollinated and enclosed in the same isolator.

The above crosses were all made in the Kirovograd area and the hybrid seedlings were grown some 300 km. further north, in the Har'kov province, so as to induce greater hardiness. Most hybrids displayed heterosis in respect of height and thickness of trunk and size of leaves. Some hybrids however, such as those of *J. nigra* x *J. regia* produced in 1947, showed no signs of their hybrid nature and were entirely maternal in character. Other hybrids of the same cross displayed combinations of parental characters or new features not present in the parents. Some of the most promising are described; they are resistant to frosts of — 35° C. and tolerate late spring frosts, in which respect they are better than the parent species; some of them have attractively coloured leaf petioles. Certain hybrids have a very short growing season; their leaves emerge in early May and begin to yellow in the middle of August.

Several hybrids of *J. regia* x *J. cinerea* are also winter hardy and tolerate spring frosts and are described; some of them, though sterile, are of interest for ornamental purposes. Two hybrids of *J. regia* x *J. mandshurica* are also described; both are stated to be winter hardy but susceptible to late spring frosts.

3325 *Lypa, A. L.* (*Some data on the history of plant acclimatization and graded acclimatization*). (*pp. 131–37*).

In an outline of the history of plant introduction in the USSR, the speaker pointed to the success of the application of Mičurin's principles, particularly the methods of wide crossing and vegetation hybridization.

3326 *Turbin, N. V.* (*Controversial questions in the theory of the origin of species and facts obtained in experiments on the introduction and acclimatization of plants*). (*pp. 138–43*).

Some of the criticisms [XXIII, 1634] of Lysenko's experiments on conversion of species and genera are reiterated, attention being called to the great number of plant species that have been moved from one set of environmental conditions to another completely different set in the course of plant introduction work without changing their taxonomic characters, not a single case of interspecific or intergeneric conversion having been reported. Many of the so-called conversions are shown to be simply the result of segregation, bud sports or even mechanical admixture.

3327 *Discussion.* (*pp. 147*–238).

A. A. Šahov pointed to the increased form development that often occurs after introduction of a plant from one ecological zone to another and claimed that this might even lead to the origin of new species; he also pointed to differences in success of introduction of a species depending on the provenance of the planting material and the environment in which it has evolved.

H. M. Vil'činskij mentioned the profound changes that have been effected in the tea plant in the course of acclimatization; 15 years ago tea rarely produced seed in the Soviet subtropics and was destroyed by light frosts; now it tolerates −22° C. and produces seed by the ton.

The importance of selection in acclimatization was emphasized by J. S. Driga, J. M. Šajtan and E. P. Korovin, who pointed out that the necessary variation is often present in natural populations and the task of acclimatization is simply to accelerate the process of natural selection. The importance of seed provenance and of selection for winter hardiness was also stressed by B. V. Grozdov, who quoted experiments with *Robinia pseudoacacia* in which seed from trees growing in different regions of the Soviet Union was planted at Brjansk; 98% of the seedlings from local seed survived temperatures of − 43° C. in the winter of 1939–40, whereas of those from Stalingrad and Bijsk only 74% survived and those from the Black Sea area all succumbed. Similarly, seed of *Acer negundo* of local provenance gave rise to vigorous trees, including a form with reddish-purple branches, which bore fruit whereas seedlings from foreign seed from more southerly areas failed to survive. Stones of apricots from Voronež sown in 1946 gave rise to a number of seedlings which in 1951 bore fruits with an average weight of 21·2 g. with a pleasant flavour and free stones. One seedling which fruited for the first time in 1952 bore fruits weighing up to 30 g. each, which produce a pleasant, aromatic jam. By similar methods a hardy form of *Prunus divaricata* has been produced from wild fruits collected in the Caucasus in 1936; it bears red, aromatic fruits equal to the local domestic plums in quality and weighing 18–20 g.; the variety, named Krasnoplodnaja Brjanskaja Alyča [Red-fruited Brjansk myrobalan], is also ornamental on account of its bright red autumn branches.

J. A. Zabelin reported that species such as *Larix decidua* and *Pinus sylvestris*, which at low temperatures are drought resistant, at high temperatures are less so. Several species have been acclimatized on the Black Sea coast by selecting the seedlings with dark green or glaucous leaves that do not lose turgor in the dry conditions of the area.

P. G. Krotkevič referred to the tendency towards hybridization in walnuts in areas like Kiev where a number of different species have been planted close together; in populations planted in 1930 seven hybrids have been detected, two of *J. regia* x *J. cinerea*, two of *J. nigra* x *J. regia* and three of *J. regia* x *J. mandshurica*. Some of these hybrids are identical with several individuals of unknown parentage found previously in other places. All hybrids display marked heterosis, one hybrid of *J. regia* x *J. mandshurica* being 16 m. high at the age of 19 years and most of them are frost resistant and have withstood − 34° C. without damage. So far no results have been obtained from vegetative hybridization but a new method of grafting has been elaborated.

N. A. Veselov mentioned some tomatoes produced in Finland by grafting on to nightshade;

they are earlier and yield more than the originals.

F. K. Teterev cited cases of interspecific conversion from the works of Mičurin, quoted also the conversion of geans to bigarreaux and rebuked some of the speakers for stating that wide crossing rather than conversion was the basic tenet of Mičurinism.

V. N. Andreev enquired why many Soviet botanists deny the evolutionary significance of varieties and lower taxa within the species, and showed how many small variants have arisen during cultivation in species such as *Acer platanoides*. Many cases are mentioned in which species have risen by hybridization, and species such as *Ulmus foliacea* and *U. suberosa* are shown to have hybridized freely in Moldavia, giving rise to intermediate forms. Varieties are considered to be incipient species, without geographical localization.

T. G. Tambert spoke of the confusion in the conception of varieties and forms in ornamental plants and made proposals for clarifying it.

Ju. A. Luks pointed out the parallel between hybridization and selection as occurring as evolutionary processes in nature and those applied in acclimatization and in plant breeding and the concept of agricultural variety was defined.

The principle of climatic analogues was criticized by several speakers and supported by others. Several speakers discussed the differences between introduction, domestication, naturalization, acclimatization and other related concepts. It was reported by some that introduction of material by seed gave better results than planting young seedlings. Other speakers emphasized the significance of phasic development for the success of introductions, the different reaction of apple varieties to changes in latitude, temperature and water supply, and the importance of pests and diseases.

3328 CROSSA-RAYNAUD, P.
L'amélioration fruitière en Tunisie; les nouvelles variétés de pêches. (**Improvement of fruit in Tunis; new varieties of peach**).
Tunis. agric. 1957 : **58** : 139–48.

Introductions of pome, stone and citrus fruits from several countries are being studied by the Tunisian Botanical and Agronomic Service. In order to obtain an early apricot variety with the high quality of Caninos, the latter has been crossed with Amor Leuch and Hamidi. A variant of Caninos named San Fernando is to be multiplied; it ripens later than Caninos. Varieties of almond which have shown promise include Cavaliera and Fournat de Brèzenaud. Two new Californian peaches with white flesh, 344–15 and 352–6, appear to be of good quality and suitable for the coastal zone between Zarzis and Tabarka. Notes are given on seven yellow-fleshed varieties from the USA; all have done well in Tunis.

3329 HIEMELEERS, J.
De kleur van bladeren en vruchten bij appel en peer. (**The colour of leaves and fruits in apple and pear**).
Agricultura, Louvain 1958 : **6** : 1–17.

The different types of pigments occurring in plastids and sap and their distribution in leaf and fruit are surveyed, varietal differences being noted. The inheritance of red flesh in Bloedpeer [Blood pear] is being studied.

3330 KLEIN, L. G.
What's new in apple color sports?
Bull. NY St. agric. Exp. Sta. 1957 : **23** : No. **4** : p. 14.

A brief popular account is given of colour sports of Delicious, Starking Richared, McIntosh and Rome Beauty under trial at Geneva, NY.

3331 PANTELIĆ, M. B.
Prilog citološkom ispitivanju domaćih sorata jabuka NR Srbije. (**A contribution to the cytological study of domestic apple varieties in the Serbian People's Republic**).
Arch. poljopr. Nauk 1957 : **10** : No. 29 : 64–69.

The varieties Budimka, Tikvaja, Medunka, Bedrika Senabija, Jeliva and Kaduman were found to be diploid ($2n = 34$), and Zelenika and Šerbetlija triploid ($2n = 48–51$). One to five laggards were observed at meiosis in the triploids. Differences between the diploid varieties in degree of meiotic regularity were noted. Importance is attached to the exploitation of spontaneous polyploidy as a means of securing improved apples.

3332 DOLGOV, V. F.
(**An experiment on raising seedlings of a dwarf apple**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 12 : 39–42. [Russian].

Mention is made of the new apple stocks Krasnolistnaja Paradizka [Red-leaved Paradise] (VIII x Krasnyj Štandard [Red Standard]) and Hybrid 13–14 (VIII x Taežnoe [Taiga]), both exceeding VIII in hardiness and having less brittle shoots and roots.

3333 SCHANDER, H.
Beobachtungen über die Variabilität des Blattes beim Apfel. (**Observations on leaf variability in apple**).
Z. Bot. 1958 : **46** : 75–84.

Variation in form was studied in leaves from different parts of the branching system of apple seedlings; the variations appeared to be varietal characteristics. The largest leaf from the middle of an upright shoot may be taken as typical of a variety and used in determining correlations between leaf characters and other characters of the plant.

3334 ŠALAVIK, A. I.
(**Confusion in the names of varieties should not be permitted**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 12 : 48–49. [Russian].

Examples are given of the confused state of the nomenclature of some Soviet apple varieties. For instance one writer refers to Naliv Belyj [White Juice] as a synonym for Pudovščina, another quotes it as a synonym for Papirovka while yet another regards it as a variety distinguished from the other two by its growth period, hardiness and other characteristics.

3335 MIRSIJANOV, V. Z.
(**Winter injury to fruit trees in Tataria**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 1 : 51–53. [Russian].

The damage observed on some apple and pear trees in the winter of 1955–56 is discussed, varietal differences being noted.

3336 BRAUN, H. & KRÖBER, H.
Untersuchungen über die durch *Phytophthora cactorum* (Leb. u. Cohn) Schroet. hervorgerufene Kragenfäule des Apfels. [**Investigations on collar rot of apple caused by *Ph. cactorum* (Leb. and Cohn) Schroet.**].
Phytopath. Z. 1958 : **32** : 35–94.

Samples of *Ph. cactorum* isolated from different plants varied in their pathogenicity on apple and other susceptible species. The only apple rootstocks found to be resistant were EMIV and EMIX; the susceptibility of several apple scions of differing age was also investigated.

3337 BOONE, D. M., KLINE, D. M. & KEITT, G. W.
***Venturia inaequalis* (Cke.) Wint. XIII. Pathogenicity of induced biochemical mutants.**
Amer. J. Bot. 1957 : **44** : 791–96.

Of 107 induced biochemical mutants of *V. inaequalis*, those requiring biotin, inositol, nicotinic acid, pantothenic acid or reduced sulphur were pathogenic while the remainder were nonpathogenic. Evidence that the loss of pathogenicity was due to the nutritional deficiencies is discussed.

3338 KLINE, D. M., BOONE, D. M. & KEITT, G. W.
***Venturia inaequalis* (Cke.) Wint. XIV. Nutritional control of pathogenicity of certain induced biochemical mutants.**
Amer. J. Bot. 1957 : **44** : 797–803.

Pathogenicity was temporarily restored, either completely or partially, to six induced biochemical mutants of *V. inaequalis*, requiring respectively choline, riboflavin, pyrimidines, arginine, histidine or methionine, by daily applications of the required substances to inoculated apple leaves. One mutant requiring adenine or hypoxanthine and another requiring guanine or hypoxanthine did not respond to this treatment and remained nonpathogenic.

3339 MOON, H. H., WILSON, R. A. & MAGNESS, J. R.
Evaluation of some pear varieties and selections for transmitting blight resistance, fruit quality and fruit size.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 70–73.

Waite transmitted the highest degree of resistance to blight (*Erwinia amylovora*) to its progeny. Michigan 437 and Ree Carlodi Wurtemburg were almost as good as Waite in this respect. Bosc, Comice, Michigan 504, Michigan 550, Vermont Beauty, Winter Bartlett and Winter Nelis conferred little, if any, resistance. A relatively high degree of resistance was obtained if both parents transmitted resistance and an intermediate degree if only one parent was resistant. A fairly high proportion of the progenies of Comice, Michigan 437 and Waite had fair or good quality of the fruit. As regards quality, Ree Carlodi Wurtemburg was a poor parent while Bosc and Winter Nelis were very poor. In general, Ree Carlodi Wurtemburg and Comice transmitted good fruit size.

3340 PIROVANO, A.
Reversioni e fluttuazioni di caratteri nel pero. (**Reversions and fluctuations of characters in the pear**).
Riv. Ortoflorofruttic. ital. 1958 : **42** : 3–6.

A plant of Beurré Clairgeau, which originated in 1838, produced a spiny branch when grafted on quince in 1938. This, together with certain other bud sports observed by the author in his pear hybrids, is described.

3341 Lisavenko, M. A.
(About "Arpyrus").
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 1 : p. 73. [Russian].

Horticulturists are advised not to give credence to M. A. Nujanzin's claim of having produced a vegetative hybrid between an apricot and a pear. This was said to give a seed progeny of both pome and stone fruits.

3342 Vysockij, A. A.
(Pears from Trubčevsk).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 1 : 57–58. [Russian].

Seven local varieties from the Trubčevsk district in the province of Brjansk are described. All are highly productive, hardy, resistant to pests and diseases and have sweet fruit which can be eaten fresh or dried. Some ripen in August, others in September or October.

3343 Šarašenidze, D. S.
(Pears on their own roots).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 1 : 55–56. [Russian].

Gambatura and Matanura, which are said to have arisen from suckers of wild Kahetian pears, are briefly described. Both produce prolific suckers which are customarily used for their reproduction. The varieties are uniform with regard to cultural characteristics, as are also the own-rooted seedlings.

3344 Hartman, H.
Catalog and evaluation of the pear collection at the Oregon Agricultural Experiment Station.
Tech. Bull. Ore. agric. Exp. Sta. 1957 : No. **41** : Pp. 80.

Pears of several species and originating from various countries are described. General performance, fruit characters and resistance to *Erwinia amylovora* are mentioned.

3345 Ogaki, C.
(On sterility genes in new Japanese varieties of oriental pear).
Kanagawa Nogyo Shikenjo Engeibunjo Kenkyu Hokoku/Bull. hort. Br. Kanagawa agric. Exp. Sta. 1957 : No. **5** : 23–26. [Japanese].

Pollination experiments involving new varieties and older forms whose sterility factors had already been analysed have led to the establishment of the following genotypes: Suisei [Green Star], S_1S_4; Ri 14, Ri 28 and He 1, S_1S_2; Asahi [Rising Sun], S_4S_5; Kumoi [Celestial], S_3S_4; and Kimizukawase [Kimizuka Early], S_2S_5.

3346 Čižov, S. T.
(Differentiation of flower buds and dormancy of the pear in connexion with winter hardiness).
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1957 : **6** : 43–50. [Russian].

Tëma, Lida, Polja and Olja, all of them interspecific hybrids involving *Pyrus ussuriensis*, were hardier and recovered better from frost injury than the Central Russian and Mičurin varieties of *P. communis* studied in the Nonchernozem Zone. No appreciable differences between varieties with regard to differentiation of the flower buds were observed, but the hybrids of *P. ussuriensis* had a shorter dormant period and initiated growth earlier than other varieties.

3347 Scaramuzzi, F.
Contributo allo studio delle cultivar di cotogno da frutto. **(Contribution to the study of quince cultivars).**
Riv. Ortoflorofruttic. ital. 1957 : **41** : 575–615; 1958 : **42** : 21–50.

The characteristics of the tree, leaves, flowers, fruits and seeds are described and illustrated for 22 cultivars, some of Italian origin and others introduced from elsewhere. The cultivars are classified according to vigour, yield, size and composition of the fruit and time of opening of the buds.

Two cases of synonymy were revealed by the study.

3348 Gluhen'kij, G. N.
(The results of varietal trials of apricot and cherry).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. **1** : p. 62. [Russian].

Some varieties of apricot and cherry which proved productive of high quality fruit in trials at Kaladžinskaja, Krasnodar territory, are named. The apricots include V32, a selection from Krasnodar, characterized by early and regular annual bearing.

3349 Lapins, K., Mann, A. J. & Keane, F. W. L.
Progeny analysis of some apricot crosses.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 125–30.

The F_1 progenies of 13 crosses involving 8 commercial varieties and locally selected seedlings were studied with respect to the following characters at Summerland, BC: fruit size, firmness and flavour; degree of freestone condition; frost hardiness of the tree; winter hardiness of the fruit buds; and resistance of the blossom to spring frost. Perfection, Reliable and Hemskirke were noteworthy as parents transmitting large fruit size. Reliable was also a good parent as regards fruit firmness and the freestone condition. Crosses involving high quality varieties such as Moorpark and Hemskirke gave a large proportion of seedlings ranking high for flavour. Reliable, S–27–5 and L–105 imparted tree hardiness to their progenies and, in the case of the first two of these parents, also hardiness of the fruit buds and blossom. Perfection gave progeny low in hardiness of the buds and blossom. The correlations between parental and seedling values for fruit characteristics indicated that the average performance of progenies may be predicted with a fair degree of certainty. A shift towards softer fruit and poorer flavour, as compared with the parents, may however be expected.

3350 Dermine, E. & Liard, O.
Identification et description de variétés du prunier européen. (**Identification and description of varieties of European plum**).
Encyclopédie Agronomique et Vétérinaire, Gembloux : Paris 1957 : Pp. 322.

Certain flower and fruit characters, which are not influenced by the environment, are described for 33 varieties widely cultivated in Belgium. Each variety is illustrated and a dichotomous key is provided.

3351 Tupicyn, D. I.
(**The prospects for promoting plum culture in Central Asia**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 1 : 44–45. [Russian].

Varieties regarded as suitable for the preparation of prunes in Central Asia are listed. Among them is Vengerka Medovaja [Honey Prune], a new variety from the Institute of Plant Industry.

3352 Gadžiev, T. Ju.
(**Winter hardiness of the plum in the province of Voronež**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 1 : 45–47. [Russian].

Some American and Far Eastern varieties and hybrids between them were distinguished by hardiness in the 1954–1956 trials at Voronež. Zarja [Dawn], Sestra Zari [Dawn's Sister] Kitajanka [Chinese] and a few other hybrids between American and Far Eastern plums were the best croppers. The yield of the American varieties was low, because they develop 70–80% of flowers without pistils under the Voronež conditions.

3353 Dostálek, J.
Příspěvek k poznání našich místních višní (*Prunus cerasus* L.). [**A contribution to the study of our local sour cherries (*P. cerasus*)**].
Sborn. čsl. Acad. zeměd. Věd: Řada rostlinná Výroba 1958 : **31** : 37–46.

Descriptions are given of the variety Rokytnice, found in mountainous districts, and eight other varieties from the viticultural region. Most appear to be variants of a self-sterile mutant of Morela Pozdné [Late Morello], but only Rokytnice, Šakvice and Kysnatka [Sour] are regarded as valuable on account of good cropping and pleasant flavour.

3354 Haritonov, A. M.
(**A pink bird-cherry**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 1 : p. 74. [Russian].

A seedling of a pink form of *Prunus padus*, with fruits suitable for making jam, wine and jellies, is thought to be of breeding value, in particular for crossing with *P. fruticosa*. It withstood a frost of — 46° C. at Ufa in the season 1955–56 and showed resistance to pests and diseases.

3355 Gerritsen, C. J.
Zijn er in Nederland mogelijkheden voor de teelt van buitenperziken? (**Are there possibilities for the cultivation of outdoor peaches in the Netherlands ?**)
Meded. Inst. Vered. TuinbGewass. 1958 : No. 124 : Pp. 24.

Investigations on the climatic and cultural requirements of peach having indicated that this crop is suitable for open-air cultivation in the Netherlands, trials of varieties and suitable rootstocks have been established in various parts of the country.

3356 Lesley, J. W.
A genetic study of inbreeding and of crossing inbred lines of peaches.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 93-103.

Nine relatively homozygous lines were developed at the University of California Citrus Experiment Station, Riverside, by controlled self pollination for three to six generations. The parentages of the lines were as follows: line 7, Peak x FP132379 ; line 9, Lovell x (Elberta x Peento F_2); line 11, Elberta x (Columbiana x Peento F_2); line 12, Elberta x Lukens Honey;

line 31, J. H. Hale x Lukens Honey; line 50, J. H. Hale x Bolivian Cling; line 88, Early Crawford x (Strawberry x Peento F_3); line 59, (Strawberry x Peento F_2) x Elberta; and line 116, (J. H. Hale x Lukens Honey F_1) x Massasoit. Inbreeding did not have any marked effect in reducing vigour and fruit size, except in line 31 and, to a lesser extent, in line 50. Several new and mostly undesirable characters appeared as the result of inbreeding, in addition to those for which recessive genes were already known to be present in the parents. Observations were made on the behaviour of characters of the inbreds in F_1 hybrids. Some crosses grew at a rate exceeding that of each parent. The intermittent brachysm shown by line 59 was recessive to the normal condition. The narrow willow-like leaf, pendulous growth and unfruitfulness of line 31 were recessive to the broader leaf, more upright growth and fruitfulness of lines 50 and 88. In winter-chilling requirement, the F_1 was as a rule distinctly closer to the parent requiring the shorter period; transgression for a shorter chilling requirement occurred in a few crosses. The character of wavy petals in the small type of corolla was almost completely recessive. In time of fruit maturity, the F_1 trees were usually intermediate between the parents, a few approaching the earlier parent. In several crosses, the fruits were as large as those of the larger-fruited parent, in others smaller or intermediate. Only family 406, derived from 7 x 50 and consisting of a single tree, had larger fruits than both parents. Persistent twinning of the fruit was dominant in some crosses and recessive in others. The ventral bulge conspicuous in the fruits of line 116 was almost completely recessive. The clingstone condition was completely recessive to the freestone. The fruit cracking affecting line 31 was almost completely recessive. Adherent skin of the ripe fruit was recessive to nonadherent but may have been affected in its expression by the texture of the flesh. Several genes appeared to condition size of the apical prominence of the fruit, a small apex usually being dominant. The mammillate type of apex was dominant to the beaked. Brown dotting on fruits of lines 7, 11 and 12 proved to be incompletely recessive. Red pigmentation near the stone was partially dominant to its absence; the data suggested that red skin and red suture were also partially dominant. The very rough surface of the stone of line 12, apart from the pronounced pits and grooves, was recessive to the smooth surface of line 88. Deep, long grooves and deep pits are probably recessive to short, shallow grooves and shallow pits. The F_1 of a cross between lines with respectively long and short spines to the stone was intermediate in spine length. The F_1 hybrid 406–1 (line 7 x line 50) and two F_1 hybrids from line 59 x line 88 may be of practical value.

3357 Oberle, G. D.
Breeding peaches and nectarines resistant to spring frosts.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 85–92.

Observations on the spring-frost resistance shown by peach and nectarine varieties and selections in the breeding orchard maintained by the Virginia Agricultural Experiment Station, near Blacksburg, are reviewed. Data on seedlings involving these varieties and selections as parents have demonstrated the influence of hardy varieties in transmitting blossom hardiness to their progeny. The peaches Veteran, Redhaven, Afterglow, Shippers Late Red and VP115 have proved outstanding as parents in this respect.

3358 Dye, M. H.
Development of streptomycin-resistant variants of *Pseudomonas syringae* van Hall in culture and in peach seedlings.
NZ J. agric. Res. 1958 : **1** : 44–50.

Streptomycin-resistant variants of *Ps. syringae* were obtained as the result of serial transfer of a sensitive strain through graded concentrations of streptomycin in broth. Resistant variants were also isolated from peach seedlings which had been sprayed with an aqueous solution containing 50 μg./ml. streptomycin and then inoculated with the sensitive strain. The majority of the resistant isolates were non-pathogenic. Further study may reveal a relationship between development of resistance and loss of pathogenicity.

3359 Delanoue, P.
Les plantations de pêchers et la mouche des fruits. (**Plantations of peach and the fruit fly**).
Tunis. agric. 1957 : **58** : 123–35.

In Tunis it appears that varietal differences in respect of attack by *Ceratitis capitata* are partly determined by the date of ripening of the fruit; when fruit of several varieties is available at the same time, the insect tends to avoid certain varieties.

3360 Sharma, A. K. & Bal, A. K.
Chromosome studies in *Citrus*. I.
Agron. lusit. 1957 : **19** : 101–26.

A study was made of the caryotypes of the following: *C. acida* var. *aurantifolia* 'China', 'Columbia' and 'Gora'; *C. decumana* 'Chinese', 'Monster Kalsia', 'Red fleshed' and 'White fleshed'; *C. limetta* 'Elachi' and 'Sarbati'; and *C. microcarpa*. The chromosomes varied in size from 3·5 μ to 1 μ and in each cultivar were divisible into groups of relatively long, medium and short pairs. The long type usually bore the secondary constrictions, ranging in number from six to eight, with six in most cultivars. The chromosome number was normally $2n = 18$, except in Monster Kalsia ($2n = 21$). Both interspecific and intraspecific differences in caryotype were found, the role played by structural alteration in evolution within the genus thus being indicated. It is suggested that nondisjunction, lagging and somatic reduction are responsible for the departures from the normal chromosome number which were found in most of the cultivars. The structural alterations appear to involve mainly fragmentation and translocation. The authors further suggest that variation in the chromosome complement of the somatic tissue occurs regularly in all vegetatively propagated plants, providing considerable opportunity for the origin of new forms [XXVI, 1979].

3361 RANGA SWAMY, N. S.
Culture of nucellar tissue of *Citrus in vitro*.
Experientia 1958 : **14** : 111–12.

By culturing a nucellus, in which proembryos had been initiated adventitiously, on White's medium + casein hydrolysate, masses of tissue designated pseudobulbils were developed; the production of pseudobulbils was enhanced by the addition of kinetin. Some of the pseudobulbils grew into seedlings with morphological peculiarities of the cotyledons, hypocotyl and stem, but the leaves were normal. It is thought that growing seedlings from pseudobulbils will prove useful for obtaining plants breeding true to the mother plant.

3362 MINESSY [MINISI], F. A. & HIGAZY [HIJAZI], M. K.
Polyembryony in different citrus varieties in Egypt.
Alexandria J. agric. Res. 1957 : **5** : 89–95.

The eight varieties studied were all polyembryonic; Baladi [Local] lime, rough lemon and sour orange had higher percentages of monoembryonic seeds than the other citrus varieties. Reducing the leaf area to 20 leaves per fruit reduced the number of embryos per seed; this effect could be offset by ringing.

3363 GARCÍA ALVAREZ, R., CASAS CARRAMIÑANA, A., ROYO IRANZO, J. & PRIMO YÚFERA, E.
Variaciones en la composición de las naranjas españolas a lo largo de la temporada 1955–56 : contenido en zumo, extracto refractométrico, acidez, índice de madurez y vitamina C. (**Variations in the composition of Spanish oranges during the season 1955–56: juice content, refractometric extract, acidity, maturity index and vitamin C**).
Bol. Inst. Invest. agron., Madr. 1957 : **17** : 239–67.

Data on the above characters are presented for eight varieties grown in various regions in Spain.

3364 PETRI, P. S. & STRIGOLI, P.
I fattori ecologici e la sessualità dei fiori del *Citrus trifoliata*. (**Ecological factors and sexuality of flowers in *C. trifoliata***).
Frutticoltura, Bologna 1958 : **20** : 53–58.

Observations at Bologna, Italy, in the severe winter of 1956 and the mild winter of 1957 showed that the proportion of hermaphrodite flowers to those which were physiologically male owing to the reduction of the ovary remained the same; in the severe winter, where temperatures below −10° C. occurred, some deformed flowers in which the pistil was entirely absent were also observed.

3365 **Find 6 disease-resistant strains of trifoliate.**
Calif. Citrogr. 1957 : **42** : p. 288.

Tests at the University of California Citrus Experiment Station have shown the following rootstock strains of *Poncirus trifoliata* to be highly resistant to common citrus diseases: Frost tetraploid, Barnes, Rubidoux, Texas, Webber-Fawcett and a USDA selection.

3366 NAITHANI, S. P. & RAGHUVANSHI, S. S.
A preliminary meiotic study in *Citrus assamensis*—a structural hybrid.
Naturwissenschaften 1958 : **45** : p. 95.

It is claimed that *C. assamensis* is the only diploid member of the genus *Citrus* so far discovered which has protoplasmic connexions between the pollen mother cells and associations of more than two chromosomes during meiosis; other irregularities, including bridges, lagging chromosomes and the formation of more than four nuclei at the second telophase were also noted in *C. assamensis*.

3367 Giacometti, D. C.
Diferenciação entre cinco tipos de limão rugoso. (**Differentiation between five types of rough lemon**).
Ceres, Minas Gerais 1957 : **10** : 111–18.

A comparison of seedlings of five different types of rough lemon grown in Brazil showed them to be similar in morphological features but different in reaction to diseases. The type known as Cravo, though not possessed of the resistance to *Exocortis* characteristic of the Florida type, is nevertheless, on the basis of its morphological characters and its susceptibility to scab, considered to be a representative of the rough lemon rather than a hybrid of *Citrus aurantifolia* x *C. reticulata*.

3368 Kawagoe, H. & Inoue, J.
(**Studies on the pollination of kaki. I. On the influence of the pollinating variety on fruit set and fruit characters**).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. exp. Sta. 1954 : No. 50 : 233–40. [Japanese].

Data are provided on the percentage pollen germination of 10 Japanese varieties. Fruit set, fruit weight, size and shape, number and weight of seeds and sugar content of the fruits in mother plants of the variety Fuyu after pollination with the above set of 10 varieties were also determined. No differences attributable to metaxenia were discovered.

3369 Laffèrs, A.
Neskororašiaci typ orecha kráľovského. (**A late-developing form of walnut**).
Poľnohospodárstvo 1957 : **4** : 587–94.

A form found at Sabinov, Slovakia, is regarded as valuable for breeding on account of its resistance to diseases and late-flowering habit whereby it escapes frost injury. Information is provided on the variability of the leaf and nut.

3370 Kuznecov, V. V. & Šreder, A. G.
(**Pecan—a hardy crop**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 1 : 53–55. [Russian].

Urožajnyj [Productive] and Uzbekistan are among the seedlings selected at the Šreder Horticultural Institute for hardiness, short growth period, regular annual bearing and large nuts. Urožajnyj is the better cropper of the two, but Uzbekistan produces larger nuts, weighing 7·6–9·0 g. as against 4·7 g. in the former. The flavour of the nuts, especially those of Uzbekistan, is good.

3371 Catherinet, M.
Un nouveau type variétal d'arachide le type Boukombé. (**A new varietal type of groundnut, the Boukombé type**).
Bull. agron. Fr. d'out. mer 1955 : No. 15 : 45–48.

Several varieties originating from North Dahomey and the Ivory Coast appear to form a distinct group on the basis of flower, pod, leaf and stipule characters and habit; the distinguishing characters are described in detail.

3372 Catherinet, M.
Étude sur le port de l'arachide cultivée. (**A study of the habit of the cultivated groundnut**).
Bull. agron. Fr. d'out. mer 1955 : No. 15 : 34–44.

Varieties are classified into ten main types according to their growth habit.

3373 Berchoux, C. de
Étude sur la résistance de l'arachide à la rosette en Haute-Volta. (**A study of the resistance of the groundnut to rosette disease in Haute-Volta**).
Oléagineux 1958 : **13** : 237–39.

Several Bambey selections maintained their resistance to rosette disease in trials at Niangoloko; they gave good yields and responded well to a light treatment with inorganic fertilizer. Some promising lines selected from local material in the Haute-Volta and northern region of the Ivory Coast also showed resistance to rosette. The resistant Bambey variety 48–34 did not seem to be less attacked by aphids than a susceptible variety; it is thought that the resistance is due to a virus inhibitor produced inside the plant.

3374 Morettini, A.
La biologia della fecondazione nelle cultivar di olivo e sua importanza pratica. (**The biology of fertilization in olive cultivars and its practical importance**).
Ital. agric. 1957 : **94** : 1103–16.

Further data [cf. XXV, 3393] are presented showing which of the olive cultivars grown in the Italian provinces of Tuscany, Ascoli Piceno, Viterbo, Rome, Garda, Palermo and Perugia are self compatible and which self incompatible. Similar data are given for table varieties. The data confirm that the majority of varieties are self incompatible. Pendolino and Morchiaio have proved the best pollinators and even self-fertile varieties like Frantoio have benefited by their use.

Several cases in which olive groves have failed to give satisfactory yields on account of the absence of suitable pollinators are referred to, together with some experiments in which flowers of the olive Leccino were bagged and pollinated artificially with various cultivars; the best pollinator proved to be Morchiaio; it gave a set of 3·251% compared with 0·392% from Moraiolo, 0·007% from bagged flowers not pollinated artificially and 0·44% from open pollination; a plant of unknown origin, referred to as cultivar X, gave a set of 2·550%.
Leccino also proved more winter hardy than other cultivars and remained undamaged after the frosts of 1956.

3375 Esajan, G. S.
(Large-fruited olives).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 1 : 74–75. [Russian].

Six Armenian varieties are briefly described. Most ripen in September. Among them Marmari produces the largest fruits, weighing 2·5–3·5 g. each. Unabpšat ripens earlier than other varieties but its fruits are appreciably smaller.

3376 Cox, J. E.
Flowering and pollination of passion-fruit.
Agric. Gaz. NSW 1957 : **68** : 573–76.

A study was made of the floral movements and pollination of *Passiflora edulis* under the climatic conditions of the central part of the coast of New South Wales. The stigmas were fully receptive from the time of flower opening until early afternoon of the same day. By noon the next day they had completely lost their receptivity. Anthesis occurred before 13.00 hr. on the first day of flower opening in 10% of the flowers and before 16·00 hr. in 50%.

3377 Gilmartin, A. J.
Post-fertilization seed and ovary development in *Passiflora edulis* Sims.
Trop. Agriculture, Trin. 1958 : **35** : 41–58.

At Waimanalo in Hawaii certain vines of *P. edulis* f. *flavicarpa* yielded a high percentage of seedless fruit; it is thought that this character may be genetically determined. Self incompatibility appeared to be general in this form; on selfed flowers the pollen grains either failed to germinate or their growth was arrested on the stigma. An illustrated account is provided of ovule development.

3378 Malaguti, G., Jiménez, H. & Horovitz, S.
Pruebas de transmisión del mosaico de la lechosa a otras especies de *Carica*. (**Tests of transmission of papaw mosaic to other species of *Carica***).
Agron. trop., Venezuela 1957 : **7** : 23–31.

C. cauliflora and *C. candamarcensis* were resistant and *C. papaya*, *C. monoica* and *C. microcarpa* susceptible to papaw mosaic transmitted by grafting.

3379 Cadman, C. H. & Fisken, A. G.
Susceptibility of raspberry varieties to infection by aphid-borne viruses.
J. hort. Sci. 1958 : **33** : 13–20.

The degree of natural infection, at the Scottish Horticultural Research Institute, of two groups of five varieties by leaf spot virus and vein-banding virus is tabulated. Under conditions of natural infection, Malling Landmark remained free of infection and it is thought that this is connected with the reluctance of the virus-transmitting aphid, *Amphorophora rubi*, to feed on this variety since both viruses multiply rapidly when plants are artificially inoculated.

3380 Klämbt, H.-D.
Untersuchungen über Entwicklung und Wuchsstoffhaushalt bei *Ribes*-Arten. I. Mitteilung. Cytologische und wuchsstoffphysiologische Untersuchungen der Samen je einer Kultursorte von *Ribes nigrum* L. und *Ribes petraeum* Wulf. x *Ribes multiflorum* Kit. nach Selbst- und Fremdbestäubung. (**Investigations on the development and metabolism of growth substances in *Ribes* species. Part I. Investigations of the cytology and physiology of growth substances of the seed of a cultivar of *R. nigrum* L. and of *R. petraeum* Wulf.** x ***R. multiflorum* Kit. after self and cross pollination**).
Planta 1958 : **50** : 526–56.

The development of seed was studied in *R. nigrum* 'Rosenthals Langtraubige' [Rosenthal's Long-clustered] selfed, Rosenthals Langtraubige x *R. nigrum* 'Goliath', *R. multiflorum* 'Heinemann's Spätlese [Heinemann's Late Harvest] selfed and Heinemann's Spätlese x *R. petraeum* 'Rote Holländer' [Red Dutchman]. For both black and red varieties the number of seed set and the rate of seed development were greater after cross pollination than after self pollination. By means of paper chromatography, the content of growth substances in seed resulting from cross pollination was found to be higher than that in seed resulting from self pollination. At least four growth substances and one inhibitor appeared to influence fruit development in *Ribes*.

3381 Petrahilev, I. M.
(The black currant seedling No. 4–15 Muromka).
Vestn. sel'skohozajajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 6 : p. 141. [Russian].

The seedling described was produced by selection from the progeny of the variety Minusinka [black currant from Minusinsk]; it has berries weighing from 1·8 to 3 g., which ripen uniformly and do not drop when ripe. The bushes have remained free from diseases.

3382 Hårdh, J. E.
Karviaishärmä ja sen torjunta. **(Gooseberry mildew and its control).**
Valt. Maatalousk. Julk. 1956 : No. 150 : Pp. 10.

It is mentioned that the so-called mountain varieties and the three cultivated Finnish varieties Hankkijan herku [Hankkija Delicacy], Hinnonmäen keltainen and Pellervo, are resistant to *Sphaerotheca mors-uvae*.

3383 Dijksterhuis, H. P.
Het nieuwe aardbeiras: Macherauch's Dauerernte. **(The new strawberry variety: Macherauch's Dauerernte).**
Tuinbouwber., Groningen 1957 : **12** : p. 185.

Under favourable weather conditions, Macherauch's Dauerernte [Macherauch's Perpetual] fruits continuously from mid-June to mid-October, producing fruit of good size and flavour throughout the season.

3384 Bringhurst, R. S. & Voth, V.
Solana strawberry.
Calif. Agric. 1958 : **12** : No. 1 : p. 13.

This new variety, selected from Cal. 177–19 x Cal. 103–22, is expected to supplement Lassen in home gardens and commercial culture. It starts fruiting later and yields less than Lassen but is of superior quality and has better resistance to *Tarsonemus pallidus* and *Sphaerotheca humuli*. It is highly susceptible to *Verticillium* wilt.

3385 Bringhurst, R. S. & Voth, V.
Effect of stratification on strawberry seed germination.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 144–49.

Experiments were carried out on 28 seed collections from 13 varieties at the University of California, Davis, to determine the most effective period of stratification for seed used in breeding.

3386 Dimitrov, P. & Topčijski, S.
(The importance of stratification of strawberry seed in strawberry breeding).
Naučn. Trud. selskostopan. Akad. Georgi Dimitrov agronom. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1957 : **4** : 101–10. [Bulgarian].

Hybrids of Madame Moutot x Eva Macherauch raised from stratified seed developed into uniform and vigorous plants which bore fruit in the following season. This permitted selection to be carried out a year earlier than among progeny raised from unstratified seed.

3387 Orchard, W. R. & van Adrichem, M. C. J.
Relative resistance of some strawberry species, varieties, and selections to powdery mildew at Saanichton, British Columbia.
Plant Dis. Reptr. 1957 : **41** : p. 945.

The disease ratings of seven *Fragaria* species, 32 varieties and 33 selections are tabulated. Auchincruive 6, *F. glauca* selections from Muncho Lake, Yukon, and Watson Lake, BC, and *F. orientalis* from south-eastern Asia showed no infection and 16 selections were resistant.

3388 Moore, H. E. (Jun.)
***Musa* and *Ensete*, the cultivated bananas.**
Baileya, Ithaca 1957 : **5** : 167–94.

An extensive review of literature on the taxonomy and on the history and evolution of the cultivated bananas is provided and followed by a key for their identification. Descriptive notes on eight species and eight doubtful species of *Musa* and three species of *Ensete* are included.

3389 Wang, H. & Chang, S.-M.
(The distribution and characteristics of the more important groups of Cayenne pineapple strains in Taiwan).
Nung-yeh Yen-chiu/Agric. Res., Taipei 1957 : **7** : 7–12. [Chinese].

As a result of a survey conducted in 1953, four types of the above variety are differentiated. What is regarded as the best type was only found in 4·51% of the plantations. [Cf. 2207].

3390 Mišurenko, A. G.
(At the V. E. Tairov Ukrainian Scientific Research Institute for Viticulture and Wine-making).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1957 : No. 8 : 33–36. [Russian].

Mention is made of some promising new hybrids, including the dessert variety 1–5–32 (Çauş [Courier] x Hamburg Muscat) and the vintage variety 1–6–30 (Kopčak x Alicante Bouchet). Other new selections are resistant to frost or *Phylloxera*, or combine hardiness with mildew resistance. Serekcija, Rkaciteli and Cabernet-Sauvignon are among the varieties that were found to possess fair resistance to *Phylloxera*.

3391 Tabidze, D. I.
(At the Scientific Research Institute for Horticulture, Viticulture and Wine-making of the Georgian Ministry of Agriculture).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1957 : No. 8 : 37–39. [Russian].

A number of new varieties obtained by hybridization are listed, as are also some dessert and wine varieties which have been selected for high quality from local or introduced material. The selected material includes mutants of Rkaciteli, Mcvane, Saperavi, Hihvi and other Georgian standards.

3392 Barrett, H. C.
***Vitis cinerea* as a source of desirable characters in grape breeding.**
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 165–68.

From observations of F_1 hybrids of selections of *V. cinerea* with Golden Muscat and Seneca at the University of Illinois, it is concluded that *V. cinerea* is capable of transmitting the following characters: adaptability to high temperature and humidity during the growing season; a high degree of disease resistance; vigour; good fertility; large, attractive compound clusters; good-quality berries free from foxiness or other objectionable flavours and aromas; high sugar content; and long-keeping ability after maturity. It should be possible to incorporate these features into existing or new varieties and thus make larger-scale grape growing possible in the warm, humid areas of the USA where most varieties now available do not flourish.

3393 Pirovano, A.
Combinazioni genomiche letali in bastardi di un vitigno persiano. **(Lethal genomic linkages in hybrids of a Persian vine).**
Ann. Sper. agr. 1958 : **12** : 103–07.

Progeny from crosses between a Persian vine, Shiraz, and *Vitis rupestris*, *V. riparia* and *V. berlandieri* have in most cases shown poor growth, early leaf fall and other signs of weakness, frequently culminating in early death of the plant, when Shiraz was used either as the male or female parent. One plant from one of the crosses involving Shiraz, IP14 x Shiraz, produced fruit and this plant was crossed with IP7, a line including *V. labrusca* 'Isabella' in its parentage. The behaviour of the progeny from this cross indicates that a lethal factor from *V. labrusca*, inherited in a Mendelian manner, becomes effective in the presence of the debilitating factor from Shiraz.

VIIIe Congrès International de la Vigne et du Vin. Santiago du Chili. **(VIIIth International Congress on vines and wines, Santiago, Chile).**
Bull. Off. int. Vin 1957 : **30–31**.

3394 *Le comportement comparé des cépages. (The comparative behaviour of scions). (No. 319 : pp. 4–71; No. 320 : pp. 72–84; No. 321 : pp. 44–55; No. 322 : pp. 83–106; No. 323 : pp. 15–86).*

In the second section of this conference [cf. 2208–22] scion varieties are discussed; the characteristics of the principal scions used in Germany, Argentina, Austria, Chile, Spain, France, Greece, Italy, Luxembourg, Portugal, Tunis and Yugoslavia are listed.

3395 Breider, H.
Struktur und Probleme des fränkischen Weinbaues. **(Organization and problems of Franconian vine cultivation).**
Prakt. Bl. PflBau 1957 : **52** : 212–15.

The new grape variety Mainriesling (Silvaner x Riesling) bred at Würzburg, Germany, is of good appearance and quality; the grapes ripen 10–14 days earlier than those of Riesling.

3396 Bisson, J.
Trois cépages secondaires rouges du Bordelais. **(Three secondary red vines of the Bordelais).**
Progr. agric. vitic. 1957 : **74** : 163–74, 189–98.

Illustrated descriptions are given of clones of Mancin, Saint Macaire and Pardotte.

3397 BRANAS, J. & TRUEL, P.
Le P.206 S.L.H. (P206SLH).
Progr. agric. vitic. 1957 : **74** : 221–23.

This dessert variety arose from a cross made at La Hulpe, Belgium, between Muscat d'Alexandrie [Alexandria Muscat] x Buckland Sweetwater. At Montpellier in France the ungrafted vines grew vigorously and the large white berries had a slight muscat flavour.

3398 TRUEL, P.
Notes sur la Regina d'Ortona. (**Notes on Regina d'Ortona**).
Progr. agric. vitic. 1957 : **74** : 112–22.

Descriptions are provided of the characteristics of the above dessert grape and of its cultivation in Italy. In appearance the berries are superior to those of Gros Vert [Large Green]. Five other scions cultivated in Ortona are briefly described.

3399 KATAR'JAN, T. G.
(**At the Magarač All-Union Scientific Research Institute of Viticulture and Wine-making**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1957 : No. 8 : 29–33. [Russian].

Among the new varieties bred at the institute and its branches, some outyield the older varieties and produce grapes of superior quality for manufacture of different kinds of wine. while others are early dessert varieties. The hybrids Magarač 58–25, 59–34 and 59–25 have highly coloured juice. Magarač 7–33 [Tagobi x (Tagobi x Amur)] withstands –30° C. without protection during the winter.

3400 POTAPENKO, JA. I.
(**At the Scientific Research Institute for Viticulture and Wine-making of the Ministry of Agriculture of the RSFSR**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1957 : No. 8 : 39–41. [Russian].

Mention is made of Fioletovyj Rannij [Early Mauve], Saperavi Severnyj [Northern Saperavi] and Festival'nyj [Festival], which together with many other new varieties, have been bred at the institute and its branch stations. The new varieties are characterized by productiveness, high quality and improved resistance to frost and mildew.

3401 COSMO, I., POLSINELLI, M. & CIRIBÌ, A.
Indagini sulla ricostituzione viticola delle Venezie ai fini dell'orientamento per i futuri impianti. Risultati della sperimentazione compiuta sui vitigni europei da vino e sui portinnesti in provincia di Belluno a decorrere dal 1923. (**Investigations on the viticultural reconstruction of the Venetian provinces with the object of providing guidance for future planting. Results of experiments carried out on European vintage grapes and on rootstocks in the province of Belluno from 1923 onwards**).
Ann. Sper. agr. **1958** : **12** : **55**–102.

After describing and reviewing the results obtained in nine experimental vineyards and commenting on the characteristics of the varieties studied the authors recommend the growing of Veltliner and Ciliegiolo in this region. Kober 5BB is the best rootstock for the cooler regions and 420A in drier and more calcareous areas.

3402 BERIDZE, G. I.
(**Let us restore the vintage grape varieties of Abhazia**).
Sad. i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 12 : 53–54. [Russian].

Descriptions are given of nine local varieties making high quality wines, mostly red wines. Among them Apapniž and Akabiliz show resistance to fungi.

3403 LEVADOUX, L.
Le popolazioni selvatiche e coltivate di *Vitis vinifera* L. (**Wild and cultivated populations of *V. vinifera* L.**).
Riv. Vitic. 1957 : **10** : 366–74, 401–12.

This is an Italian translation, slightly abridged, of a work already referred to [XXVII, 2239].

3404 LELAKIS, P.
Induction de la polyploïdie chez *Vitis vinifera* L. par application de la colchicine. (**Induction of polyploidy in *V. vinifera* L. by application of colchicine**).
Ann. Éc. Agric. Montpellier 1957 : **30** : 3–60.

A short summary of research on the induction of polyploidy by colchicine is followed by ampelographic descriptions of ten dessert varieties of *V. vinifera* which were treated with colchicine at Montpellier. The technique described involved opening a bud and placing a drop of 0·5% colchicine mixed with 10% glycerine on the tip; three repetitions of this treatment at intervals of a few days were sufficient to induce polyploidy. The tetraploid shoots differed from the diploid in characters such as deeper leaf colour, greater leaf and stomatal size and a higher density of stomata on the leaf surfaces. Of the ten varieties treated as above, only one failed to produce polyploid tissue; three varieties developed periclinal chimeras.

3405 LOOMIS, N. H. & WILLIAMS, C. F.
A new genetic flower type of the Muscadine grape.
J. Hered. 1957 : **48** : p. 294.

Seedling 36–2A appears to be homozygous for the perfect-flowered condition. It originated as a self of the ♀ variety Dearing.

3406 POLSINELLI, M.
Risultati di alcuni anni di osservazioni effettuate su un gruppo di 140 vitigni portinnesti. (**Results of several years' observations on a group of 140 vine rootstocks**).
Riv. Vitic. 1957 : **10** : 358–65.

The results of observations on vegetative vigour, maturation of wood and resistance to *Phylloxera*, mildew, anthracnose and melanosis are presented and the vines that have proved the best in each respect are listed. It is pointed out that certain little known stocks are in every respect better than many of those in popular use in Italy; the most promising of all are thought to be Berlandieri x Riparia 7605, Gagliardo, Berlandieri x Rupestris 131 Ruggeri, Solonis x Rupestris 211–3 and Cosmo's selection 10 of Teleki 8.

3407 COSMO, I.
Due promettenti selezioni del "Teleki 8": il "C.2" ed il "C.10". (**Two promising selections of Teleki 8 : C2 and C10**).
Riv. Vitic. 1957 : **10** : 419–25.

An outline is given of the work of S. Teleki in producing seedlings of *Vitis berlandieri* resistant to *Phylloxera vastatrix* and of experience in Italy with Teleki's seedlings 5A and 8B. Both proved to be mixed populations and from 8B no less than 6 distinct biotypes were selected. Two of these selections, which are described, have in the last 25 years proved superior to other rootstocks, including Kober 5BB, in vigour, uniformity and resistance to anthracnose and other diseases as well as being resistant to *Phylloxera*, early and compatible with the main European vine varieties grown in northern Italy. One of them, named Cosmo 2, is suitable for drier ground and the other, Cosmo 10, for more humid situations.

3408 PRINC, JA. J. & KISKIN, P. H.
(**Using *Vitis amurensis* for breeding vines resistant to frost, mildew and *Phylloxera***).
Vestn. sel'skohozjajstv. Nauk (Rep. agric. Sci.) 1957 : No. 10 : 75–86. [Russian].

Seedlings from crosses of European vines with *V. amurensis* were vigorous in growth, those from Rara Neagră [Black Rara] x *V. amurensis* attaining a height of 90 cm. in the first year in Moldavia, where Rara Neagră itself grew to only 18–25 cm. Their vegetation period was 13–23 days shorter than that of the European parent and in other characters too the hybrids tended to resemble the *V. amurensis* parent; 50% of the seedlings began to bear in the third year. In most crosses the seedlings bore either male or female inflorescences, the former being predominant; in crosses of Rara Neagră and Chardon hermaphrodite flowers also occurred. The average weight per bunch was from 11 g. to 21 g., the maximum being 65 g. The fruits are resistant to *Botrytis cinerea*; on account of the earlier maturity of the wood the seedlings are more frost resistant and have withstood −10·7° to −12·2° C. without damage to the cambium.

No material change was effected in the hybrids by grafting the European parent on to them but the yield of berries was increased from 2 kg. to 3·5 kg. per plant by grafting the seedlings on to good European varieties; the weight per berry was raised from 0·73 g. to 1·03 g.

The seedlings are classed as sufficiently resistant to mildew and *Phylloxera* to be grown without spraying or grafting. Their sugar content is higher than that of the parents and the wine produced from them has been pronounced satisfactory.

3409 CAMPBELL, R. W. & GOSHEH, N.
Hardiness studies of selected grape varieties.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 161–64.

The relative hardiness of some French hybrids and American varieties was determined by tests of electrolytic resistance. Wide variation in the response of cuttings or rooted plants was found among the varieties when they were treated at −10 and −17° F. The cuttings and rooted plants of Bertille Seyve 2862, Baco 1, Seibel 15062 and Seyve Villard 14287 were considered to be equal to Concord in hardiness.

3410 Fel'dberg, K. A.
(The hardiness of vines in the Don basin).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. **1** : 68–70. [Russian].

Krasavica Cegleda [Cegled's Beauty], Csaba Pearl and Malingre Seedling suffered the least injury due to frost in trials carried out at Stalino in the period from 1953 to 1956. Other varieties less hardy than these, but suitable for cultivation in some districts of the Vorošilovgrad and Stalino provinces, are mentioned.

3411 Boubals, D.
Sur le comportement du mildiou de la vigne (*Plasmopara viticola* B. et C. Berl. et de T.) lors d'inoculations de cultures de tissues de Vitacées. [**On the behaviour of vine mildew (*P. viticola* B. et C. Berl. et de T.) when used to inoculate tissue cultures of vitaceous species**].
Progr. agric. vitic. 1957 : **74** : 122–24.

This is an extract from a paper summarized previously [XXVII, 4483].

FORESTRY

3412 Lammert, A.
Neue Züchtungsmethoden in Dänemark. **(New methods of breeding in Denmark).**
Allg. Forstztg. 1958 : **69** : p. 39.

The forest-tree breeding methods briefly described include: (1) estimating the qualities of a tree by testing scions and cuttings from it under various conditions; (2) controlling pollination by planting vegetatively produced progeny from selected parents in a district where there are no other trees of the same kind and (3) preventing illegitimate crosses by enclosing trees within plastic covers.

3413 Darmer, G.
Zur Frage der Züchtung und Anzucht von Verbauungspflanzen für die flurschützende Landschaftsgestaltung. I. Gehölze. **(On the question of breeding and multiplication of plants suitable for the rational planting of natural areas for the purpose of conservation. I. Woods).**
Z. Pflanzenz. 1958 : **39** : 71–96.

After a brief summary of recent advances in the breeding of trees, the special characters required in trees for conservation purposes are mentioned. For example if the tree is to prevent the soil from being blown away it must have an extensive root system and if the soil is rather wet a tree with a high water requirement would help with drainage. In considering the progress made in producing trees for such purposes, the breeding of *Populus*, *Robinia*, *Pseudotsuga*, *Sorbus*, *Hippophae*, *Sambucus*, walnut and hazel receives special mention.

3414 Nilsson, B.
Om sambandet mellan moderträd och avkomma hos tall och gran. **(On the correlation between mother tree and progeny in pine and spruce).**
Svenska SkogsvFören. Tidskr. 1958 : **56** : 55–68.

This paper has already been summarized from another source [951].

3415 Brandt, K.
Hedeselskabets skovfrøcentral. **(The Heath Society's Forest Seed Centre).**
Hedeselsk. Tidsskr., Aarhus 1958 : **79** : 2–10.

The work of the above centre in Denmark includes testing races of different provenance, single tree selection and the establishment of seed orchards in which controlled crossing is to be effected.

3416 Bouvarel, P.
Génétique forestière et amélioration des arbres forestiers. (Deuxième-Partie). **(Forestry genetics and forest-tree breeding. Part II).**
Bull. Soc. bot. Fr. 1957 : **104** : 552–86.

In the second part of this series [cf. XXVI, 3796], the author reviews methods used in improving forest trees. Special mention is made of interspecific hybridization and the production of polyploids; a full bibliography is included.

3417 Sakai, K.
(Theoretical studies on the technique of plant breeding. IV. The estimation of genetic correlations in forest-tree breeding and its application).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 83–86. [Japanese].

Let P_1, P_2, P_3 be characters in an adult F_0 mother tree, its juvenile F_1 offspring obtained by open pollination, and its adult F_1 offspring, respectively; let H_2, H_3 be the respective genetic effects on P_2, P_3; let $r_{P_1P_2}$ and $r_{H_2H_3}$ be the phenotypic and genotypic correlations between P_1, P_2 and H_2, H_3 respectively; and let h_1^2, h_2^2 be the heritabilities of P_1, P_2. Then, assuming $h_1 = h_2$,

$$r_{H_2H_3} = \frac{2r_{P_1P_2}}{h_2^2}$$

If $\varDelta G_3$ represents genetic gain with regard to P, I the selection differential applied to the F_1 juvenile trees, and $\sigma^2_{H_2}$, $\sigma^2_{H_3}$ the genetic variances of P_2, P_3 respectively, then

$$\varDelta G_3 = I\, h_2\, r_{H_2H_3} \frac{\sigma_{H_3}}{\sigma_{H_2}}$$

Since $\sigma^2_{H_3}$ is unknown, it may be permissible to estimate $\varDelta G_3$ by assuming that $\sigma_{H_3} = \sigma_{H_2}$. [Cf. XXVII, 2499].

3418 BARNER, H. & CHRISTIANSEN, H.
On the extraction of forest-tree pollen from inflorescences forced in a specially designed house.
Silv. genet. 1958 : **7** : 19–24.

A description is presented of the pollen house used by the Plant Breeding Station at Humlebæk, Denmark, for preventing contamination by foreign pollen, when controlled crosses are being made. The catkin-bearing twigs are enclosed in glass-walled compartments which need not be opened until the pollen has been shed. During the forcing period a high air humidity and a relatively low air temperature are maintained. When the anthers are ripe, they are induced to shed their pollen by slightly reducing the humidity of the air; the pollen is collected by a suction device. Information is provided on the techniques used for extracting pollen from species of *Alnus*, *Larix*, *Fagus*, *Quercus*, *Picea* and *Pinus*.

3419 COOPERRIDER, M.
Introgressive hybridization between *Quercus marilandica* and *Q. velutina* in Iowa.
Amer. J. Bot. 1957 : **44** : 804–10.

The results of the study reported here indicate that most of the specimens of "*Q. marilandica*" collected in Iowa are hybrids, *Q.* x *bushii* Sarg., that the putative parents are probably *Q. marilandica* and *Q. velutina* and that back crossing to both parents occurs.

3420 KEITH, W. M. (JUN.).
Analysis of vegetative propagation in *Quercus prinoides*.
Rhodora 1957 : **59** : 306–08.

While *Q. prinoides* is probably conspecific with *Q. muehlenbergii*, it differs from the latter in reproducing vegetatively by suckers. Acorns are produced abundantly but seedlings appear to establish themselves infrequently. The evolutionary significance of this type of reproductive behaviour is briefly analysed [cf. XXII, 3011].

3421 KYRYLENKO, T. S.
(Indicators of oak leaf resistance to mildew).
Ukrajin. bot. Ž. 1957 : **14** : No. **3** : 78–83. [Ukrainian].

A high peroxidase and catalase activity of the leaves and a low rate of respiration and oxidation are associated with improved resistance to *Microsphaera alphitoides*.

3422 MOMOTANI, Y.
On *Acer cappadocicum* var. *indicum* Rehder.
Acta phytotax. geobot. 1956 : **16** : 161–65.

Statistical biometrical studies of *Acer mono* and vars. *indicum*, *cappadocicum* and *sinense* of *A. cappadocicum* are held to substantiate the taxonomic status previously given to the four taxa.

3423 OSKARSSON, O.
En snabbväxande asp—en nykomlig för våra skogar. **(A rapidly growing aspen, a newcomer for our forests).**
Tidskr. Lantm., Helsinki 1958 : **40** : 14–16.

This is a popular article describing the development of the hybrid aspen by crossing the native Finnish aspen with a North American species. Its chief advantage is its rapid growth rate, which may be 4–11 times that of either parent.

3424 LITTLE, E. L. (JUN.), BRINKMAN, K. A. & MCCOMB, A. L.
Two natural Iowa hybrid poplars.
For. Sci. 1957 : **3** : 253–62.

Descriptions are given of two clones known as the Shimek and Sherrill poplars, which have been identified as natural hybrids between *Populus alba* and *P. grandidentata*.

Both are fast growing and readily propagated from stem and root cuttings. Sherill is male and has average form; its wood is suitable as a whitish veneer for panelling on account of its wavy figure. Shimek is female, with good form.

3425 QUAIRIÈRE, A. L.
Le peuplier en Belgique. **(The poplar in Belgium).**
Ann. Gembl. 1958 : **64** : 16–46.

Notes are provided on cultivars of *Populus* with special mention of some recommended varieties of *P. deltoides* and Euramerican hybrids; a key is included for identifying young trees of eight cultivars.

3426 JOACHIM, H. F.
Über die Spreewald-Pappel. (**The Spreewald poplar**).
Silv. genet. 1958 : **7** : 25–30.

A full description is given of a form of poplar found in the Spreewald district of Germany; it is thought to be a hybrid of *Populus nigra* x *P. euramericana* cv. *serotina*. This poplar grows particularly well on damp soils and rarely suffers from any kind of disorder.

3427 WATERMAN, A. M.
Canker and dieback of poplars caused by *Dothichiza populea*.
For. Sci. 1957 : **3** : 175–83.

The results of inoculating 92 clones representing 38 interspecific hybrids emphasized the susceptibility of the *Tacamahaca* and *Aegeiros* groups to *D. populea*. Most of the clones having *P. deltoides* as one parent remained free from infection or were only slightly susceptible.

3428 TARIS, B.
Contribution à l'étude des maladies cryptogamiques des rameaux et des jeunes plants de peuplier. (**A contribution to the study of the cryptogamic diseases of the branches and young plants of poplar**).
Ann. Inst. nat. agron. 1957 : **43** : 233–478.

Morphological descriptions are provided of the four cultivars of poplar studied; of these, *Populus euramericana* 'I214 Casale' was the least susceptible to *Dothichiza populea*, *Cytospora chrysosperma* and *Fusarium avenaceum*. *P. deltoides* 'Virginiana' and *P. euramericana* 'Serotina de Champagne' showed some resistance to *C. chrysosperma* and to *F. avenaceum* respectively.

3429 MELVILLE, R.
***Ulmus canescens*: an eastern Mediterranean elm.**
Kew Bull. 1957 (1958) : No. 3 : 499–502.

U. canescens is differentiated from *U. carpinifolia* by the pubescence of the branches, petioles and under surface of the leaves. It occurs in scattered localities in the countries bordering on the eastern Mediterranean.

3430 KUNDZIŅŠ, A.
(**Hybrids of black and grey alder in the forests of the Latvian SSR**).
Latv. PSR Zināt. Akad. Vestis 1957 : No. 2 : 69–74. [Russian].

Natural hybrids between *Alnus glutinosa* and *A. incana* found in Latvia showed a higher rate of growth and resistance to drought than the pure species and were more moderate in their soil requirements. In artificial crosses involving *A. glutinosa* as a female parent, 1·5% of viable seed was obtained and in the reciprocals 26%.

3431 WETTSTEIN, W. & HOLZER, K.
Vergleichende Untersuchungen an Schwarzerlen (*Alnus glutinosa*). [**Comparative studies in alders (*A. glutinosa*)**].
Züchter 1958 : **28** : 62–63.

Studies were made at Mariabrunn of promising alders (K1–K8) selected in the district around Bruck in northern Austria, F_2 progeny from a cross of *A. glutinosa* x *A. cordata* (M1–M3), and a suspected chimera (C1). The volume of the cones and 1000-seed weight of the mother trees appeared to be correlated with the height of two-year-old progeny in all the selections except K4. The germinating capacity of seed from the K selections was 50–70%, from the hybrids 8–20% and from C1 0·5%. Pollen from C1 was not uniform and included fragmented cells; most of the 70 seedlings obtained from C1 did not develop. Root-tip preparations of the surviving plants indicated that triploids, diploids and mixoploids were present. Triploid seedlings had larger stomata than the diploids and the leaves of diploids were more rounded than those of triploids and mixoploids.

3432 J., M.
Los eucaliptos. (**The eucalypts**).
Biota 1957 : **2** : No. 11–12 : 1–21.

In tests of 60–80 varieties carried out at Puno, Peru, during 1930–40 the best results were given by varieties of *Eucalyptus globosus*. Bailey's key to the species is reproduced, with brief descriptions of the individual species.

3433 **Cultivation of the cricket bat willow.**
Bull. For. Comm. Lond. 1958 : No. 17 : 2nd Ed. : Pp. 34.

As in the first edition [cf. VII, 431], a chapter on the Systematy of the cricket bat willow and its allies is to be found in the revised edition of this bulletin.

3434 KHOSHOO, T. N.
Cytology of conifers III. Partial failure of meiotic spindle in *Cephalotaxus drupacea* var. *pedunculata*.
Cytologia, Tokyo 1957 : **22** : 80–89.

A detailed account of investigations referred to earlier is given [cf. XXVII, 4514].

3435 Pollock, E. G.
The sex chromosomes of the maidenhair tree.
J. Hered. 1957 : **48** : 290–94.

A satellite was present on the long arm of each member of a pair of short subterminally-constricted chromosomes in the ♀ of *Ginkgo biloba*, whereas in the ♂ only one chromosome of the pair had a satellite. It is concluded that this pair is associated with sex determination. In both ♀ and ♂ trees satellites were found on the shorter arms of the longest pair of the complement.

3436 Vidaković, M.
Investigations on the intermediate type between the Austrian and the Scots pine.
Silv. genet. 1958 : **7** : 12–19.

In Emmedsbo, East Jutland, three trees in a stand of Austrian pine appeared to be hybrids between the Austrian pine and the Scots pine. A detailed examination of the external morphology and needle structure of the three specimens revealed that they were intermediate in these characters between the Austrian pine and the Scots pine. Meiosis was normal and the pollen fertile. Cytological studies showed that the differences in size between small and large chromosomes in Scots pine is greater than in Austrian pine. It was found that when the chromosomes were arranged in a series according to size and regression coefficients were calculated (assuming the length of the chromosome to be a function of its serial number) then the inclination of the regression lines was significantly different between the Austrian and Scots pine but not between the three specimens from Emmedsbo and either the Scots or the Austrian pine. The supposed hybrids seemed to show some hybrid vigour in that they were growing more rapidly than Austrian pines of the same age.

3437 Mergen, F.
Genetic variation in needle characteristics of slash pine and in some of its hybrids.
Silv. genet. 1958 : **7** : 1–9.

Seedlings of *Pinus elliottii* var. *elliottii* were collected from 12 districts in Georgia and Florida and grown under uniform conditions. The number of resin ducts in the needles was found to range from one to four. Seedlings from central and north-eastern parts of Florida and the south-eastern part of Georgia had the smallest number of needles with three ducts. Seedlings from eastern districts had a higher number of stomata per mm. than those from western sources. The distribution of average number of stomata per mm. in needles from Citrus County, Florida, was thought to indicate that natural introgressive hybridization with the south Florida slash pine, *P. elliottii* var. *densa*, had occurred. The needle characteristics studied seemed to be under the control of multiple genes and the number of stomata per unit length was not greatly affected by the environment. An F_1 hybrid from a controlled cross of *P. taeda* x *P. elliottii* had needle characteristics intermediate between those of its parents. The degree of hybridity in putative natural hybrids between *P. elliottii* and *P. palustris* and vars. *elliottii* and *densa* of *P. elliottii* could be evaluated by giving numerical values to the needle characteristics and applying biometrical tests.

3438 Zobel, B. J. & Rhodes, R. R.
Specific gravity indices for use in breeding loblolly pine.
For. Sci. 1957 : **3** : 281–85.

Investigations on *Pinus taeda* showed that for trees under 11 years of age the specific gravity of the bole may be estimated from the specific gravity of a limb section. For trees of all ages an adjacent or terminal limb section may be used, but in the case of older seedlings terminal sections give better results. The validity of the bole-limb relationship in progeny testing was demonstrated by an analysis of two open-pollinated and three supposedly selfed progeny of trees with high and low specific gravity. No relationship has so far been found between the specific gravity of the boles of scion parents and the specific gravity of the limbs developed by the grafted scions.

3439 Cram, W. H. & Worden, H. A.
Maturity of white spruce cones and seed.
For. Sci. 1957 : **3** : 263–69.

A report is given of investigations carried out on *Picea glauca* at the Forest Nursery Station, Indian Head, Sask., in connexion with breeding. Specific gravity or moisture content proved to be a reliable index of cone and seed maturity. It is suggested that tests of cone maturity should be made 90 days after pollen shedding.

3440 Simak, M.
Den slovakiska lärken. (**The Slovakian larch**).
Svenska SkogsvFören. Tidskr. 1958 : **56** : 123–36.

The nomenclature and distribution of the above larch are surveyed, the name *Larix decidua* ssp. *carpatica* var. *slovacica* being adopted. Three ecotypes are distinguished and described: *tatrensis* (800–1600 m.), *subtatrensis* (400–1200 m.) and *sarisensis* (400–800 m.). Some provenance races of the Slovakian larch have shown promise in trials not only in Czechoslovakia but also in Switzerland, Great Britain, Sweden and Germany.

3441 ORR-EWING, A. L.
Further inbreeding studies with Douglas fir.
For. Chron. 1957 : **33** : 318–32.

Further study of the trees used in earlier work [XXIV, 3394 and XXVI, 3493] indicated that selfing usually results in a greatly reduced yield of seed and in less vigorous seedlings than those from controlled cross pollination and that natural self pollination may occur. Theoretical and practical aspects of inbreeding in Douglas fir are discussed.

3442 ORR-EWING, A. L.
Possible occurrence of viable unfertilized seeds in Douglas-fir.
For. Sci. 1957 : **3** : 243–48.

Evidence has been obtained by the British Columbia Forest Service suggesting that agamospermy may occur occasionally in *Pseudotsuga menziesii*. Some of the possible ways in which agamospermy could occur in this species are discussed.

VEGETABLES

3443 **Research into plant breeding.**
Tomato Cucumber Mark. Bd. J. 1958 : **7** : p. 5.

A short account is given of breeding at the Glasshouse Crops Research Institute, Littlehampton, England.

Cucumber. Early and total yields and resistance to leaf mildew are receiving attention. Work is being carried out on the production of sterile triploids.

Tomato. Trials of F_1 hybrids and commercial varieties have supplied information on combining ability which will facilitate the choice of parents for future F_1 hybrids. The following projects are also under way: production of short-jointed compact forms of existing commercial varieties, which will be eventually used as parents for F_1 hybrids; development of new pure-breeding varieties with compact habit and high-quality fruit; and investigation of the genetics of fruit pigmentation with special reference to the problem of blotchy ripening.

3444 MÜLLER, N.
Gemüsesaatgut - Neuheitenüberprüfung 1955/56, VI (Schluss). [**Vegetable seed examination of new varieties, 1955/56, VI (Conclusion)**].
Mitt. Klosterneuburg 1958 : **8** : 43–47.

Brief descriptions and notes on the general performance of five cabbages, six beetroots and one variety of celeriac tested at two Austrian centres are presented.

3445 IVANOV, I. M.
(**New varieties of vegetable crops along the western flank of the Urals**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 1 : 13–15. [Russian].

Of a large number of varieties tested, the following are recommended.

Beetroot. Two varieties from Gribovo and one from the Arctic Research Station of the Institute of Plant Industry proved more productive than the previous standards. Podzimnjaja A474 [Late-autumn A474] from Gribovo is the only variety which does not bolt under local conditions, even when sown in late autumn.

Carrot. Osinskaja was selected at Perm'. It outyields Nantes and has a higher percentage of marketable roots; these are generally larger than those of Nantes and the flavour is good.

Cabbage. A local variety, Kazanka [cabbage from Kazan'], is mentioned for high yield, firm heads and good flavour. Other recommended varieties include Zolotoj Gektar 1432 [Golden Hectare 1432], which outyields Nomer Pervyj [Number One], forms larger heads, has a shorter growth period and is not susceptible to splitting; two varieties from Gribovo are characterized by large heads, high yields and good keeping properties, and Nomer Pervyj Poljarnyj K206 [Arctic Number One K206] is suitable for cultivation in northern districts.

Cucumber. The local variety Kingar has been made a standard. Murom and Vjazniki were the earliest and the most productive among the older outdoor varieties.

Tomato. Gruntovyj Gribovskij 1180 [Outdoor Gribovo 1180], Alpat'eva 905a [Alpat'ev's 905a] and Karlik 1185 [Dwarf 1185], all three from Gribovo, exceed the previous standards in hardiness, earliness and productiveness. The last two are bush types.

Report of the Horticultural Experiment Station and Products Laboratory, for 1955 and 1956, Ont. Dep. Agric. Pp. 117.

3446 *Plant breeding and variety testing, new projects.* (*p. 41*).

Cucumber. Accessions reputed to be resistant to *Erysiphe cichoracearum* are under test with a view to their use in breeding for resistance.

Tomato. High resistance to tobacco mosaic has been found in lines of *Lycopersicon hirsutum* and *L. peruvianum* and breeding lines have been derived from them. A back-cross programme designed to incorporate one of the uniform ripening genes into several commercial varieties is in progress and other genetical studies are under way.

Egg plant. The inheritance of resistance to *Verticillium albo-atrum*, found in some introduced lines, is being studied so that a back-cross programme for incorporating resistance into commercial varieties may be initiated.

3447 *Kerr, E. A. Vinequeen, a leaf-mould resistant tomato for the greenhouse.* (*pp. 42–43*).

This variety originated from a cross between John Baer and *Lycopersicon hirsutum* which was twice back crossed to John Baer and then crossed with Vetomold and the breeding line F101, which possesses three genes for resistance to *Cladosporium fulvum*. Vinequeen is immune from all known races of *C. fulvum*, is vigorous and has large firm-fleshed fruits with a high ascorbic acid content. The fruit flavour is acceptable and its transporting quality is good.

3448 *Kerr, E. A. Breeding of cannery tomatoes, 1909 to 1956.* (*pp. 44–60*).

Much of the work covered in this review has already been summarized from other sources. The primary objectives of the breeding programme are early maturity, improved fruit characters and disease resistance and seven promising breeding lines are briefly described. Other projects include breeding for high ascorbic acid content, combined with studies of the inheritance of this character, and the investigation of the possibility of utilizing hybrid vigour in intervarietal crosses, including the use of male-sterile lines in the production of hybrids.

3449 *Robb, O. J. Velvet lettuce.* (*pp. 61–63*).
Selected from an unknown English variety in 1925 this line has been maintained true to type and disease-free since then and was named in 1956. It is of the butterleaf heading type, with smooth, thick, dark green leaves in a compact head four to five inches in diameter. The leaves are tender and crisp, mild in flavour, and the heads mature early and do not bolt prematurely. It is recommended for home gardens or for market gardens.

3450 *Gullett, E. A. & Truscott, J. H. L. Preservation by canning: fruit variety tests.* (*pp. 83–87*).

A total of 10 varieties of apricot, 15 of cherry, 21 of peach, 6 of black raspberry and 10 each of red raspberry and strawberry were examined in trials between 1950 and 1956. Quality data are presented and discussed.

3451 *Gullet, E. A. & Truscott, J. H. L. Preservation by freezing: fruit variety tests.* (*pp. 88–91*).

Details of fruit quality when preserved by freezing are tabulated for 10 varieties of apricot, 13 of cherry, 21 of peach, 7 of black raspberry, 13 of red raspberry and 11 of strawberry tested between 1950 and 1956.

3452 *Gullet, E. A. & Truscott, J. H. L. Cooking tests of apple varieties after storage.* (*pp. 91–95*).

Quality data are provided for eight intervarietal hybrids and ten varieties showing the rating of the fruit when used in sauce, baked or in pies, in a minimum of three years' trials.

3453 Yeager, A. F. & Meader, E. M. **Breeding new vegetable varieties.** Sta. Bull. NH agric. Exp. Sta. 1957 : No. 440 : Pp. 33.

Among the varieties described here, the following have been referred to earlier: Greencrop and Scarlet Beauty beans and New Hampshire Red Pickling tomato [XXVI, 237], Doublerich tomato [XXIII, 1809] and New Hampshire Surecrop tomato [XXVII, 3548].

Capsicum. Pinocchio and Sweet Salad peppers are both extremely early ripening. The former variety, from Early Sweet x Christmas Bell, has long, red, thin-walled fruits, held well above the leaves. It was intended primarily for use as an ornamental plant but the dried fruits may be ground and used as paprika. Sweet Salad, (Merrimack Wonder x Pennwonder) x Large Red Cherry, is characterized by thick-walled, tomato-shaped, sweet fruits, which may develop a mouldy core during long periods of wet weather.

Other breeding has been directed towards the production of a variety with large fruits which remain green when ripe and another producing very small, sweet fruits. To achieve the first object a late-maturing long-fruited, thin-walled line was crossed with Merrimack Wonder and homozygous, green fruited plants selected from the F_2, since green colour is determined by a recessive gene. True breeding early-maturing lines with desirable fruit characters have now been established and have been back crossed to Burlington with a view to developing lines with thicker fruit walls. In the second breeding programme Pinocchio has been crossed with a small, red-cherry variety and those progeny with the smallest fruits crossed with a tiny, round-fruited, hot pepper. Some lines with perfectly round, tiny, sweet fruits and others with hot fruits, which are extremely early ripening, have been developed.

Physalis. Crosses have been made among *Ph. peruviana, Ph. barbadensis* and *Ph. ixocarpa* but most of the progeny are parthenocarpic and the most satisfactory progress has been made by selection within the second and third species.

Beetroot. Sweetheart beetroot was selected from a cross between a sugar beet selection US 225, and Detroit Dark Red beetroot. The roots are smooth, oval and tapered and contain 15% soluble solids, largely due to the presence of sugar. Their quality is excellent and they store well.

Carrot. Selection has been carried out within the Chantenay variety with a view to developing a strain which does not become bitter in storage. After two generations of selection the development of the bitter principle has been reduced to one quarter of that of the original variety. Crosses have been made between a long-rooted bright orange variety from Japan and Nantes, which is crisp and of excellent quality, with the object of combining these characters in a new variety.

A variety with medium-long, high-quality roots suitable for bunching or packaging has been selected from Hutchinson x Morse's Bunching and named Durham.

Brassica. Red pigmented tetraploid plants from a cross between *Brassica pekinensis* 'Wong Bok' and a red cabbage variety have been back crossed to a yellow-fleshed swede and selection carried out in the progeny on the basis of root colour and shape. Red-fleshed lines were found to breed true while white-fleshed lines gave progeny segregating into white and yellow-fleshed types. It is pointed out that the character determining white root colour must have been derived from either the red or Chinese cabbage parent since only true-breeding yellow swedes were used, while the red colour factor must have been derived from the red cabbage parent.

With the aim of producing a red Chinese cabbage, leafy progeny were selected from the cross mentioned above but seed production was found to be poor. Back crossing of both the double and triple cross to Chinese cabbage gave good seed yields and selection and intercrossing of firm heading, red plants is continuing.

Progress has also been made in the development of a dwarf red Brussels sprout by selection from the progeny of a cross between Catskill and a red European variety and by back crossing to the red variety.

Melon. The parents of Nectarmelon are a Korean sweet melon, Kimmaka, and a honeydew melon from North Africa, Jauné Canaire [Canary Yellow]. The new melon is extremely early ripening and has green flesh and a golden rind and separates from the stem when ripe. The fruits weigh about one pound and have a distinctive flavour.

Nectarmelon has been back crossed to Jauné Canaire to give high-quality, large honeydew melons from which early-maturing lines are being selected. It has also been crossed with Bay City pumpkin and Delicious 51 and high-quality, netted melons with nearly white sweet flesh have been obtained among the progeny, as well as green and orange fleshed fruits and a few with both green and orange coloration.

Water melon. The Market Midget water melon (New Hampshire Midget x Winter Queen) is characterized by its tough green rind and bright red, sweet flesh. It keeps well and the tough rind prevents damage during transport. In order to develop a small water melon which turns orange when ripe, a cross was made between New Hampshire Midget and Pumpkin Rind, which remains green until ripening. Selection was carried out in the F_2 and later generations on the basis of small size, red flesh colour and rind colour and back crossing to a high-quality water melon with green rind has been carried out with a view to improving the quality of the orange-rind selections.

Squash. Three new squashes have been bred: Amber (Wasekurikawa [Early Chestnut] x Butternut), Baby Butternut (Tsurukubi [Crane's Neck] x Butternut) and Orange Buttercup (Balkabaği [Sweet pumpkin] x New Hampshire Bush Buttercup), one parent of each of the first two being from the Far East and one parent of the third from Turkey. Amber is a family-sized squash with a mottled green and tan rind and dark orange, sweet, moist flesh whose cooking quality equals that of Butternut.

Baby Butternut is thought to be of particular value because of its small size and high cooking quality. High yields are produced of early maturing, waxy-coated, long-keeping fruits, none of which have crooked necks, unlike those of Butternut. The earliest ripening fruits may be more or less seedless but those ripening later produce good seed. The third squash, Orange Buttercup, is also early maturing, producing a few large, orange, high-quality fruits.

Other breeding has been directed towards the production of an orange dwarf squash, a dwarf variety with edible seeds and a large orange squash for peeling. In the first part of the breeding programme a cross has been made between an orange dwarf squash from Wyoming, Cheyenne 54125–1, and New Hampshire Bush Buttercup. Plants with fruit of good cooking quality and flavour, with bright orange rind and dry, bright orange flesh have been selected in the F_2 and further selection of early lines is in progress. Dwarf squashes of the Table Queen type with edible seeds with soft testas have been produced from crosses involving a pumpkin with soft testas from Germany, UConn, Early Yellow Prolific, Early Chinese, Burpee's Bush Table Queen and Delicate. These lines already breed true for the dwarf habit and edible-seed characters and further selection for size, shape and colour of fruits is in progress. Balkabaği, used in the development of Orange Buttercup, has also been crossed with Pink Banana, with the object of developing a squash without green pigment beneath the peel and desirable progeny have been obtained in the F_2 and subsequent generations.

Tomato. Only one of the tomato varieties described is new. Named Johnny Jumpup, its parents include Bison, Victor and Farthest North. The plants are small and compact and the entire crop ripens from seed, in 100 days. The oblate red fruits have many locules and while not expected to be useful commercially should be valuable for juice and salads.

Seeds of Chatham tomatoes have been exposed to X rays and thermal neutrons in the hope of developing plants resistant to *Alternaria* blight. Germination vigour of the X-irradiated plants varied considerably but by the end of the growing season little variation could be observed among the plants, while those treated with thermal neutrons showed considerable variation, including some completely or partially sterile plants and some small plants.

Bean. Four new bean varieties are included, New Hampshire Giant, selected in the breeding programme that led to the variety Greencrop, Red Shellout, a selection from *Phaseolus vulgaris* x *Ph. multiflorus* probably backcrossed to *Ph. vulgaris*, Royalty, selected from a cross between a climbing round-pod line named Florida 501 blue pod and a stringy, flat-pod, blue dwarf bean, and Shelleasy (Flash x Littleton). The first variety produces flat, green, stringless pods, 10 to 11 inches long, of good quality, but it cannot be grown satisfactorily in the eastern USA. Red Shellout produces red seeds which keep their colour after cooking and are of good flavour and quality. Royalty is a round-pod, dwarf snap bean with tan seeds. The pods are blue, making picking easier, and turn green after a few minutes cooking. This characteristic is described as "a built-in blanching indicator'. The last bean, Shelleasy, is an early dwarf variety, well adapted to machine shelling since the pods may be opened easily at the green-shell stage of maturity.

With a view to developing a high-quality climbing wax bean, crosses were made between a stringless dwarf wax bean and Kentucky Wonder. Repeated selection among the progeny has resulted in a productive climbing variety with waxy pods up to a foot in length, of a better shape than those of Kentucky Wonder. Breeding lines of three types have been obtained from Horticultural Lima (probably *Ph. vulgaris* x Bumblebee). All three lines have large flat seeds but in the first they are uniform light red, in the second red mottled and in the third have a light background with dark yellow streaks. All are rather susceptible to mosaic and leaf-hopper damage.

Pea. Peas with purple pods have been obtained from crosses between a purple-podded variety from England on the one hand and Mayflower, Tiny Tim and Progress 9 on the other. The intensity of the purple colour varies between lines and in some cases decreases as the fruit reaches maturity. Some of the peas were found to have a high tannin content and quality is being improved by selection for sweet seeds and by back crossing to high quality green-podded lines.

Sweet corn. Mention is made of a new sweet corn variety, Cocheco, characterized by its extreme earliness. Selected from Golden Gem x Fort Kent it is short and gives yellow grain but is of only moderate quality.

3454 Ashour, W. E. ['Ashur, W. 'A.]

Damping-off of some solanaceous vegetable seeds.

Alexandria J. agric. Res. 1956 : **4** : No. **1** : 57–70.

Varietal differences in the resistance of tomatoes, red peppers and egg plants to damping off of germinating seeds caused by *Fusarium oxysporum, Rhizoctonia solani* (*Pellicularia filamentosa*) and *Alternaria tenuis* are recorded.

3455 JACKSON, A. A.
A bolting-resistant strain of Detroit beet.
J. hort. Sci. 1958 : **33** : 39–42.

Selection at Wye, England, for reduction in bolting in Detroit Dark Red between 1948 and 1955 has resulted in a marked decrease in bolting, the percentage of bolting in the selected strain at maturity being one quarter that in the unselected commercial variety, with no loss in yield of the non-bolted plants.

3456 HULBARY, R. L., RAO, A. N. & MICHEL, B. E.
The development of flowers within the ovary of *Raphanus sativus*.
Proc. Iowa Acad. Sci. 1957 : **64** : 127–31.

Fruits in which one of the basal ovules was replaced by a flower-like structure with a tubular perianth, numerous stamens and rudimentary ovary have been found in inbred material of the radish Crimson Giant.

3457 TATEBE, T.
(Studies on the behaviour of incompatible radish pollen).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1957 : **26** : 21–27. [Japanese].

Incompatible pollen applied to the bud germinates more rapidly than compatible pollen applied to the open flower in the variety Shogoin. Both 2*x* and 4*x* strains of Minowase [Mino Early] are self incompatible; the 2*x* strain is cross compatible; the compatibility of the 4*x* strain varies according to the particular combination attempted. Percentage germination of the pollen is high in direct and reciprocal 4*x* x 2*x* crosses of Minowase.

3458 OELKE, J.
Zur Physiologie der Selbst- und Kreuzungssterilität beim Radieschen (*Raphanus sativus* L.). [**On the physiology of self and cross sterility in the radish (*R. sativus* L.)**].
Züchter 1957 : **27** : 358–69.

Sterility in the radish was found to be determined by the osmotic relations between the pollen and stigmatic papillae. Pollen from self-sterile plants germinated on stigmas from buds or withered flowers of the same plant but not on stigmas from two-day-old flowers; in the latter case, the osmotic pressure of the cells of the stigma was at its highest value. The osmotic pressure of the stigmatic cells is related to the rate of evaporation from the stigma. Only pollen from two-day-old flowers is normally fertile. Grafting radish on kohl rabi did not affect the sterility relationships of the plant. Crosses between radish and kohl rabi failed although the pollen germinated; no evidence for a pollen inhibitor in the style was found.

3459 MELEŠKIN, A. S.
(The best Jerusalem artichoke variety in the Latvian SSR).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. **5** : 46–49. [Russian].

Belaja Urožajnaja [White Productive] was more productive of forage than Vadim in most districts of Latvia. Both varieties came from North Osetia and were the only ones tested except an Ukrainian hybrid of Jerusalem artichoke with sunflower with rather coarse stems having a low forage value. In tuber yield the hybrid equalled or surpassed Belaja Urožajnaja.

3460 SCARAMELLA-PETRI, P., STRIGOLI, P. & SANGIORGI, A. V.
Influenza della bile a diverse concentrazioni sui tessuti radicali di *Allium cepa* L. (**The influence of bile at several concentrations on root tissues of *A. cepa* L.**).
Caryologia 1957 : **10** : 181–208.

Solutions of pig bile were found to exert a mitostatic effect on onion root tips at concentrations of 8% upwards.

3461 DU BOIS, A. M., TURIAN, G. & GONET, A.
Recherches sur l'action mitostatique de l'acide borique dans le méristème radiculaire d'*Allium cepa* L. (**Research on the mitostatic action of boric acid in the root meristem of *A. cepa* L.**).
Caryologia 1957 : **10** : 102–10.

At sublethal concentrations boric acid was found to arrest mitosis at the prophase stage and to cause characteristic deformities of the nucleolus.

3462 MELETTI, P.
Azioni citologiche di elettroliti e non-elettroliti sulla cellula vegetale con particolare riguardo agli effetti di soluzioni ipertoniche. (**The cytological action of electrolytes and nonelectrolytes on plant cells with particular reference to the effect of hypertonic solutions**).
Caryologia 1957 : **10** : 161–80.

The roots of bulbs of *Allium cepa* have been treated with solutions of KCl, $NaNO_3$, K_2SO_4, $(NH_4)_2SO_4$, glucose and sucrose at seven different concentrations. The four highest concentrations of each, all hypertonic to the cell sap, caused mitostatic effects, stickiness, c-mitosis and wilting of the roots, the latter effect being reversed by placing the roots in water. The suggestion that these effects result from dehydration of the cells and nuclei is discussed [cf. XXVII, 1153].

3463 GORI, C. & ZUCCONI, L.
L'azione citologica indotta da un gruppo di composti inorganici su *Allium cepa*. (**The cytological action induced by a group of inorganic compounds on *A. cepa***).
Caryologia 1957 : **10** : 29–45.

The 15 compounds used, manganese chloride, uranyl nitrate, thorium nitrate, sodium arsenite, mercury bichloride, copper sulphate, tantalum potassium fluoride, zirconium oxychloride, nickel sulphate, calcium diphosphate, barium chloride, sodium tungstate, vanadium chloride, sodium cobalt nitrite and cobalt sulphate, were all found to be toxic and to cause stickiness, the degree of which varied with the concentration used. Complete or partial c-mitosis was caused by sodium arsenite, nickel sulphate, mercury bichloride and cobalt sulphate and the latter compound also caused some chromosome doubling. Chromosome breakage was caused by cobalt sulphate and sodium cobalt nitrite.

3464 KRICKL, M.
Richtlinien für die Auswahl der für die Züchtung geeigneten Elitezwiebeln. (**Criteria for the selection of élite onions suitable for breeding**).
Saatgutwirtschaft 1957 : **9** : 175–76.

Experiments in Vienna showed that repeated selection for early ripening reduced harvest losses resulting from bulbs failing to ripen.

3465 DAVIS, E. W.
The distribution of the male-sterility gene in onion.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 316–18.

Test crosses of introductions from 11 countries indicated that *ms* has a wide geographical distribution.

3466 AVANZI, S.
Inibizione dell'effetto citologico dell'acetato di tallio per mezzo della cisteina. (**Inhibition of the cytological effect of thallium acetate by means of cysteine**).
Caryologia 1957 : **10** : 96–101.

When these two chemicals were applied simultaneously to onion root tips cysteine was found to inhibit completely the cytological effect of thallium acetate [XXVII, 2523] without reducing its toxicity.

3467 BATTAGLIA, E.
Allium ascalonicum L., *A. fistulosum* L., *A. cepa* L.: analisi cariotipica. (***A. ascalonicum* L., *A. fistulosum* L., *A. cepa* L.: caryotypic analysis**).
Caryologia 1957 : **10** : 1–28.

Caryotypic studies of the above three species are reported in detail. In all three the caryotype may be represented by the formula $2n = 16 = 2\mathrm{M}_1 + 2\mathrm{M}_2 + 2\mathrm{M}_3 + 2\mathrm{M}_4 + 2\mathrm{M}_5 + 2\mathrm{M}_6 + 2\mathrm{M}_7^{s} + 2\mathrm{M}_8$ but in *A. fistulosum* the short arm of the M_7^{s} chromosome has a larger satellite and a longer and wider secondary constriction. Some specimens of *A. cepa* have four or three nucleoli, with the caryotypes $2\mathrm{M}_7^{s} + 2\mathrm{M}_8^{s}$ or $2\mathrm{M}_7^{s} + \mathrm{M}_8 + \mathrm{M}_8^{s}$ respectively. It is suggested that the three species had a common origin.

3468 AYERS, G. W.
Races of *Plasmodiophora brassicae*.
Canad. J. Bot. 1957 : **35** : 923–32.

Evidence is presented and discussed for distinguishing between six races of *P. brassicae*, from isolates from the USA and Canada, on the basis of their pathogenicity to differential hosts including wild and cultivated crucifers, namely Wilhelmsburger swede, Nappan hybrid swede lines, Laurentian swede, *Sisymbrium altissimum*, *Brassica nigra*, *Brassica campestris* and Wisconsin clubroot-resistant cabbage lines. The degree of clubbing shown by *B. campestris*, *B. nigra* and *Lepidium densiflorum* suggested that specimens of these species were heterozygous for resistance while the results with Nappan swedes and Wisconsin club-root resistant cabbage lines indicate that resistance is polygenically determined.

3469 NIEUWHOF, M. & KRAAI, A.
Praktijkproeven met spitskool 1956–1957. (**Practical trials of pointed-headed cabbage**).
Meded. Dir. Tuinb. 1958 : **21** : 94–100.

Of 18 strains tested, ten are recommended, all belonging to the variety Eersteling. Extreme earliness was usually correlated with low productivity. Strains with similar productivity varied in number of outer leaves.

3470 Nakagawa, H., Kamimura, S., Sato, I. & Henmi [Hemmi], S.
(The combining ability of cabbage varieties and strains).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 66–75. [Japanese].

Instances of heterosis in respect of earliness or yield are reported in crosses involving strains of Japanese and introduced varieties. The following varietal combinations were most promising: Nakanowase [Nakano Early] x Yoshin, Nambu [Southern] x Nozakigokuwase [Nozaki Extra Early], Nambu x Nakanochusei [Nakano Midseason] and Nambu x Perfection Savoy.

3471 Nakagawa, H., Kamimura, S., Sato, I. & Henmi [Hemmi], S.
(Studies on breeding *Brassica pekinensis*. II. Hybrid vigour in crosses between self-incompatible strains and differences in its manifestation).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1957 : **26** : 163–70. [Japanese].

From crosses involving 23 self-incompatible strains from the varieties Matsushima 2 and Chiba 1 [Thousand-leaved 1], 48 F_1 hybrids were obtained. The hybrids tended to exceed the parents in yield and head weight; heterosis in respect of earliness and leaf number was less frequent. Some correlations between parental and hybrid performance were noted. Six promising hybrids were selected. [Cf. XXVII, 3514].

3472 Fedulova, A. P.
(Production of early-maturing, high-yielding F_1 hybrids of white cabbage resistant to bolting).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 9 : 23–27. [Russian].

The variety Zolotoj Gektar 1432 [Golden Hectare 1432] was crossed with a series of other cabbage varieties of varying degrees of earliness. In crosses with early and medium-early varieties the F_1 hybrids when grown near Leningrad were mostly intermediate between the two parents in earliness and yield; certain other hybrids were intermediate in time of maturity but excelled the parents in yield; hybrids with VIR1133 [Institute of Plant Industry 1133] and Kaporka Odesskaja [Odessa Kaporka] are described as early, free from bolting and satisfactory in yield, in which respect the former of the two displayed heterosis. Hybrids with Jersey Queen and Wakefield were distinguished by freedom from bolting, combined with earliness and yield, and those with the late varieties Amager 611 and Dauerweiss [White Keeping] by good keeping capacity.

3473 Popov, V. I.
(Varietal resistance of white cabbage to black rot).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 5 : 26–29. [Russian].

When grown in fields artificially infected with *Xanthomonas campestris*, varieties like Likuriška, in which the xylem contains a large amount of mechanical tissue, proved more resistant than those with a high proportion of parenchymatous cells.

3474 Pelletier, R. L. & Simard, J.
Effets de certains produits chimiques sur la résistance du chou à la jaunisse (*Fusarium* f. *conglutinans*) (WR.) Snyder & Hansen. **(Effects of certain chemical products on the resistance of cabbage to yellows [*F.* f. *conglutinans* (WR) Snyder & Hansen]).**
38th Rep. Quebec Soc. Prot. Pl. 1956 : 40–44.

Treatment with either a solution of p-nitrophenol or 2,4-D produced a significant increase in the resistance to *F. oxysporum* f. *conglutinans* of a variety with the A type of resistance. An application of p-nitrophenol rendered a susceptible variety and a variety with the B type of resistance considerably more vulnerable to *Fusarium.*

3475 Gliha-Botić, N.
O gospodarskoj vrijednosti nekih sorata stočnog kelja. **(On the agronomic value of some varieties of kale).**
Arch. poljopr. Nauk 1957 : **10** : No. 29 : 79–90.

The results are reported of trials conducted by the Agricultural Institute, Zagreb with a series of kale varieties. Information is provided on the yield of fresh and dry material, content of digestible starch and protein and resistance to disease. Marrow-stem kale varieties gave the best results.

3476 Crnko, J.
Comportamiento de variedades de espinaca en "La Consulta", Mendoza. **(Performance of spinach varieties at La Consulta, Mendoza).**
Idia 1957 : No. 112 : 18–31.

Detailed information on leaf type, seed type, yield, maturity period and other botanical and agronomic characters of 17 introduced varieties tested at the above station in Argentina during the period 1950–55 is presented.

3477 Sneep, J.
Geschiedenis van de spinazie en het ontstaan van de rassen. (**The history of spinach and the origin of the varieties**).
Meded. Inst. Vered. TuinbGewass. 1957 : No. 112 : Pp. 32.

After a survey of early written records showing spinach to have been cultivated since the 12th century AD in Europe and rather earlier in Arabia, Persia and China, the main botanical species and their distribution are noted and descriptions are given of the leaf and seed characters and disease resistance of the most important European and North American varieties mentioned in the literature up to the present day. Prickly-seeded varieties seem to have been cultivated earlier than round-seeded.

3478 Sneep, J.
De stand van de veredeling bij spinazie. (**The present position of spinach breeding**).
Meded. Inst. Vered. TuinbGewass. 1957 : No. 113 : Pp. 198.

After a general review of spinach breeding, work at the Wageningen Institute of Horticultural Plant Breeding is described. Studies of germination energy revealed no significant differences between prickly and round seeded varieties or between male and female plants. Nor was any relation between sex and retention of germinating capacity observed. In varieties such as Utrecht Winter, in which the upper parts of the male inflorescences are leafless, there was a significant difference between the leaf yields of male and female plants; varieties in which the male is leafy throughout showed no such difference. In none of the varieties studied was a difference between sexes noted in weight of the first four, ten or fifteen leaves. Male plants, especially those which were leafless above, tended to bolt sooner than female and were shorter lived, but both sexes began to flower at about the same time. No sexual differences in winter hardiness, leaf shape or resistance to $KClO_3$ could be established.

Plants could be subdivided into 21 groups according to flower type. In studies of isolation methods, spatial isolation was best; isolation in the greenhouse necessitated artificial pollination. The production of more than one generation a year is favoured by long days and a temperature of about 20° C. and by sowing incompletely ripened seed.

Mass selection is generally used for maintenance of varieties. In breeding new varieties, family selection has proved useful. No incompatibility has been observed, either in sib crosses in diecious forms or in selfings of monecious plants, and I_6 and I_7 plants showed marked homogeneity and little inbreeding depression.

Prickly seed is monogenically determined and dominant over round seed. The F_1 of a cross between a smooth-leaved and a Savoy-leaved variety was intermediate and the F_2 comprised about a quarter of each parental type and a wide range of intermediates. Leaf colour in different varieties appears to involve different factors. The F_1 of a cross between a short-petioled and a long-petioled form had long petioles while both parental and intermediate forms occurred in the F_2. Genetic ratios for bolting were obscured by temperature effects. The F_1 of a cross between nonhardy spinach and the winter-hardy variety Spica was winter hardy. Resistance to *Peronospora spinaciae* was determined by a single dominant factor, as was also resistance to *Cucumis* virus 1. Both the F_1 and the F_2 of a cross between a variety which grows slowly in short days and one which grows rapidly tended to grow slowly.

The possibilities of producing hybrid seed are discussed. It has proved possible to breed an almost entirely female F_1 which may be of use in this respect.

The report concludes with recommendations for methods of testing and breeding for disease resistance, hardiness and earliness.

3479 Manner, R.
Ett fall av stark inavelsdepression hos vitsenap (*Sinapis alba* L.) [**A case of severe inbreeding depression in white mustard (*S. alba* L.)**].
Medd. Gullåk. VäxtförädlAnst. 1957 : No. 14 : 42–44.

Severe inbreeding depression was found in isolation material (line 3713) developed from a French commercial sample. When compared with some F_1 plants derived from the same original population or the I_1 plants of the parents of the hybrids, the average height of 3713 was 12·3 cm., that of the I_1 plants 55·1 cm. and that of the F_1 69·7 cm. The flower buds of 3713 failed to open.

3480 Hoppe, W.
Befruchtungsregulierung und ihre Wirkung bei der Züchtung von Senf (*Sinapis alba*). [**Regulation of fertilization and its effect in breeding mustard (*S. alba*)**].
Züchter 1958 : **28** : 60–62.

After a brief summary of the literature on the system of reproduction in *S. alba*, breeding for increased seed yield in progress at the Plant Breeding Institute of Gross-Lüsewitz is described. The number of ovules in the ovary is determined before the flower buds open; only plants with a satisfactory number of ovules are retained for breeding. It was found that, by making a slight scratch with a thumb nail on the ovary wall, the number of ovules could be easily observed with the naked eye. By continued selection, plants with eight seeds in a pod were obtained and crosses between such plants gave some progeny with 12 and 13 seeds per pod. It is not yet known whether this high yield will remain as a fixed character in subsequent generations or whether it was the effect of heterosis.

The yielding capacity of mustard plants may be determined in the winter by keeping the plants under artificial illumination in a greenhouse.

3481 GOODE, M. J.
Physiological specialization in *Colletotrichum lagenarium.*
Phytopathology 1958 : **48** : 79–83.

Isolates of the above pathogen from a number of cucurbits in North Carolina in 1955 and 1956 could be divided into three physiological races on the basis of their pathogenicity, although they were morphologically and culturally indistinguishable. Race 1 was virulent on all cucumber varieties and on susceptible water melons and moderately virulent on Butternut squash. Race 2 was highly pathogenic to all cucumber and water-melon varieties and moderately pathogenic to Butternut squash while race 3 resembled race 1 in its effect on cucumbers and water melons but did not attack Butternut. Potential sources of resistance to all three races were found in both cucumber and water melon [cf. XXVII, 2370 and 3522].

3482 **Fusarium resistant muskmelon.**
Hort. News, NJ 1958 : **39** : p. 3270.

Sparton Rock, developed by the Michigan Agricultural Experiment Station from a selection programme involving Fusarium Wilt Resistant Michigan 55 and a local strain of Honey Rock, has shown a high level of resistance to *Fusarium* wilt in greenhouse tests and field trials. The fruits of this new variety are nearly spherical, averaging four inches in diameter and weighing two to three pounds. They are heavily netted and slightly ribbed, having thick, firm, orange flesh with a high sugar content, and are superior to Honey Rock in transporting and keeping quality.

3483 WATTS, V. M.
The Hope Diamond, bred for wilt and anthracnose resistance.
Sth. Seedsman 1958 : **21** : No. 2 : 22–23, 36.

Selected at the Department of Horticulture and Forestry of the University of Arkansas from a cross between Black Diamond and a wilt and anthracnose resistant breeding line, the Hope Diamond water melon is expected to replace Black Diamond in areas in the southern USA where the latter fails, owing to the presence of *Fusarium* wilt. The fruits of the new variety are similar in appearance to those of Black Diamond but are slightly smaller, with finer, bright red flesh of excellent quality and with a high sugar content. The fruit quality is maintained throughout the season and in fruits of all sizes. The transporting and keeping quality of Hope Diamond is also good.

3484 FILOV, A. I.
(For the quickest progress in cucurbit cultivation).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 1 : 31–33. [Russian].

The water melons Melitopol' 143, Bykovo 73 and Bykovo 23 from the lower Volga basin are mentioned for their good transportability and keeping properties.

3485 GOODE, M. J.
Physiological specialization in the cucurbit anthracnose fungus *Colletotrichum lagenarium.*
Diss. Abstr. 1957 : **17** : Publ. No. 21, 903 : 1642–43. (Abst.)

As already reported, three physiological races of *Colletotrichum* (*Glomerella*) *lagenarium* have been identified among isolates collected in N. Carolina [cf. XXVII, 3522]. Information is now also given on potential sources of resistance to the three races. In the water melon, Charleston Gray, Congo, Fairfax and Black Kleckley were resistant to race 1. The first three of these varieties were, in addition, highly resistant to race 3. All the water-melon varieties tested were susceptible to race 2 but 19 introductions showed some resistance. In the cucumber, all varieties proved susceptible to race 1 but some individuals of the introductions PI197087 and

PI175111 were highly resistant. These two introductions and the breeding lines SC50A–8 and SC50E–4 were resistant to race 2. Resistance to race 3 was found in PI 197087, 163213 and 175111 and the breeding line SC50B–5.

3486 Maltzahn, K. E. von

A study of size differences in two strains of *Cucurbita pepo* L. I. Gross size differences. II. Histological and cellular size differences.

Canad. J. Bot. 1957 : **35** : 809–43.

Differences in mature-organ size but not in number of organs were found between CF, isolated from a race of Connecticut field pumpkins and SRC, from a small round Chinese gourd, at Halifax, Nova Scotia. The parental strains showed similar rates of organ formation while progeny from crosses between them showed hybrid vigour with respect to this character. Differences in internode length were determined by differences both in cell size and cell numbers and cambial activity was found to be greater in CF than in SRC.

3487 Meščerov, Ė. T.

(**An experiment on producing hybrid seed of cucumbers**).

Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 6 : 43–47. [Russian].

Several lines of cucumber, mostly from Japanese material, have been found in which purely female flowers occur in the axils of many of the leaves and by selection from these lines and hybrids of them it has been possible to produce lines in which 50% or more of the plants bear no male flowers. Two such lines, named Mnogoplodnyj 2372/9 [Many-fruited 2372/9] and Izobil'nyj 2036/8 [Prolific 2036/8] respectively, are described. By sowing these varieties in alternate rows with ordinary varieties and removing those plants that were not pure females in the early stages, it was possible to produce hybrid seed which, in the best combination of parents, gave rise to plants giving 160% more fruit yield than the standard variety Nežinskij; the yield of the first five pickings was 267·8% greater than the standard and considerably higher than that of Hybrid 221, which is now on the approved list; the fruits were also less subject to browning. Some of the other hybrids were equal to the earliest varieties in time of ripening and exceeded them in yield; cucumbers suitable for growing in the northerly zones are being produced in this way.

3488 Ito, H. & Saito, T.

(**Studies on the conditions controlling the differentiation of female, male and hermaphrodite cucumber flowers. VII. The effect of long day and high night temperature treatment applied for short periods at the seedling stage on the sex of the flowers**).

Engei Gakkai Zasshi/J. hort. Ass. Japan 1957 : **26** : 149–53. [Japanese].

In the previous paper of this series, it was reported that long photoperiods and high night temperature favour the development of male flowers [2344]. Additional data are provided in this contribution on the intensity of this effect with regard to duration of treatment and stage of seedling development at which it is applied.

3489 Sekiya, K.

(**The influence of day length and temperature on female-flower formation in the cucumber**).

Utsunomiya Daigaku Nogakubu Gakujutsu Hokoku/Bull. Coll. Agric. Utsunomiya Univ. 1957 : **3** : 71–77. [Japanese].

A combination of short photoperiods (8 hr.) and low temperature (10–20° C.) at the early stages of seedling development had a marked effect in increasing the number of female flowers.

3490 Alpat'ev, A. A., Erina, O. J. & Bugarevič, G. B.

(**Principles for choosing the initial material for breeding early tomatoes by the method of hybridization**).

Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 6 : 3–9. [Russian].

Marked differences between varieties have been noted in the length of the phase from germination to flowering and from fruit setting to ripening, some varieties being short in the first phase and others short in the second. Tabular data are presented to show that most hybrids between two varieties were earlier than the earlier of the two parents or equal to it; segregation occurred in the F_2 and F_3; in one cross 20% of the hybrids were earlier than the earlier parent, 50% equal to it and 40% equal to the later of the parents; in another cross, 10% of the F_2 plants ripened in 110–113 days at Gribovo near Moscow and 10% ripened in 118–121 days, the early parent taking 122–125 days or more. Several of the hybrids excelled the standard early varieties in the proportion of fruits that ripened early. Thus the F_2 Gruntovoj Alpat'eva

[Alpat'ev's Outdoor] x Hybrid 15/10 produced 63 c. of ripe fruit per ha. by 18 August, which is equivalent to 20% of its total yield, F_3 Krajnyj Sever [Far North] x Krupnyj Voronova [Voronov's Large] produced 74 c. per ha. (= 19%) and F_3 Sokolova x Kondion produced 82 c. per ha. (= 23%), whereas Gruntovoj Alpat'eva produced only 27 c. per ha. (= 9%). The majority of the hybrids also ripened more uniformly.

Some of the crosses showed transgression in the direction of late ripening.

3491 QUINONES, F. A.
Heterosis in tomatoes as affected by diverse origin of parents.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 366–72.

A study was made of 52 F_1 crosses within and between the following groups of parents: (1) Firesteel, Pritchard and Rutgers, having only *Lycopersicon esculentum* in their recorded pedigrees; (2) Pan America, Southland, Pearl Harbor and Wisconsin 55, with *L. pimpinellifolium* as an immediate or distant ancestor; (3) High C and New Hampshire 50, chiefly of *L. esculentum* - *L. peruvianum* derivation; and (4) Lanai, Maui and Hawaii, having *L. esculentum*, *L. pimpinellifolium* and *L. peruvianum* in their complex pedigrees. Heterosis for total and early yields and yield of grade-I fruit amounted to 25·1, 15·3 and 17·8% respectively in terms of the average of the parents. Fruit size showed a 2·1% decrease in the hybrids as compared with the average of the parents. A few hybrids were however significantly superior in fruit size to the largest-fruited variety in the test. Total and early yields and yield of grade-I fruit were significantly higher in several crosses than in the better parent of the particular cross, but none of these hybrids was superior to the best variety in any of these respects. It is concluded that, in general, parental origin did not have a significant effect upon heterosis.

3492 SOOST, R. K. & LESLEY, J. W.
Gene studies in tomato species hybrids. Segregation of *Lycopersicon esculentum* marker genes in back-cross progenies from hybrids with *L. chilense*.
J. Hered. 1957 : **48** : 285–89.

Using plants of *L. esculentum* which were heterozygous or homozygous for recessive marker genes, seven F_1 individuals were obtained from crosses with *L. chilense* as ♂. The F_1 plants were crossed with *L. esculentum* stocks homozygous for the recessive genes under analysis. The expression of a^+, r^+ and y^+ in the back crosses was greatly altered either by corresponding alleles or by epistatic modifiers in *L. chilense*. Segregation of *c*, *j*, *d*, and *l* showed no significant deviations from the expected monogenic inheritance.

3493 GEORGIEVA, R.
(Using physiological changes in desiccated plants in wide vegetative hybridization).
Izv. Inst. Rastenievădstvo (News Inst. Pl.-Industr.), Sofia 1957 : No. **4** : 17–43. [Bulgarian].

An account is given of vegetative hybridization between tomato and *Cyphomandra*, where the former, serving as scion, was desiccated previously to grafting; this apparently improved compatibility between the two components. Plants in the first seed generation showed variability in the anatomic structure of the leaves. By grafting the plants again on *Cyphomandra*, variability in the next seed generation was intensified. It affected the shape and size, dry matter content and keeping quality of the fruits. Changes were also observed in yield and growth period. Some plants gave wholly or partially sterile seed progeny.

3494 KURKI, L. M. & WITTWER, S. H.
Thermoperiodity and flower formation in some tomato varieties.
Maataloust. Aikakausk. 1956 : **28** : 223–28.

In greenhouse experiments at Michigan State University, twelve varieties were exposed to night temperatures of 50–55° and 65–70° F. for 2 weeks from the time when the cotyledons were fully expanded. The day temperature was about 77°. The number of days to the first open flower was greater at the lower temperatures than the higher in all varieties expect Rutgers. With lower temperatures, the number of nodes to the first inflorescence was reduced in all varieties and the number of nodes to the second inflorescence in most. Low temperatures caused an increase in the number of flowers in the first and second inflorescences, except in Pearson and J. Morgan which showed a reduction in this respect.

3495 SOOST, R. K. & RICK, C. M.
Effect of varieties of pollen and ovule parents on natural cross-pollination of tomatoes.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 357–65.

Seed yield and percentage of flowers setting fruit were determined for male-sterile mutants of

Earliana (ms_{14}), San Marzano (ms_9) and Pearson (ms_2) when interplanted with fertile plants of these varieties and Red Currant at Davis, Calif. Rate of cross pollination, as measured by the percentage of flowers setting fruit, varied according to the pollen parent. San Marzano and Earliana were responsible for higher rates than the other two varieties in all of the four years during which the investigations were carried out. As pollen parents, Earliana and San Marzano were also more effective than Pearson and Red Currant with respect to number of seeds per plant. The differences in the effect of the ♀ parents upon percentage of flowers setting fruit were also significant, with San Marzano having a higher percentage than Earliana or Pearson in all years. Because a higher proportion of its flowers set fruit, San Marzano had in addition the greatest seed yield. Differences in number of seeds per fruit, as influenced by ♂ or ♀ parent, were not marked. San Marzano as ♀ parent was however consistently inferior in this respect to the other two varieties.

3496 NICKESON, R. L.
Selection for combining ability in a male-sterile tomato line having two recessive seedling genes.
Diss. Abstr. 1957 : **17** : Publ. No. 22,471 : p. 1876. (Abst.).

Eight F_3 plants (NC–1–48 x Firesteel), homozygous for the recessive genes governing functional male sterility, green stem and potato leaf, were tested for combining ability in crosses with Break o'Day and Penn Orange. Because of its high general combining ability for early growth, fruit size and early, total and marketable yields, F_3 plant 4 was chosen for selfing. No single F_4 plant was outstanding for combining ability with the F_1-hybrid tester Penn Orange x Bounty, but plant 4 in this generation was in general a good combiner and also ranked high in combining ability for early yield. An F_7 line has been developed from F_4 plant 4. Although further tests are required, it is expected that this line has attained an acceptable degree of homozygosity and would be suitable as a substitute for Firesteel in F_1-hybrid production.

3497 DOBY, J.
A paradiscomtermesztés helyzete és távlatai. (**The present state of tomato production and its prospects**).
Agrártudomány 1958 : **10** : 17–22.

Data on the canning quality and earliness of a number of Hungarian tomatoes are included.

3498 LA ROTONDA, C.
I problemi tecnologici dell'industria conserviera ed il miglioramento genetico del pomodoro. (**The technological problems of the canning industry and the genetic improvement of the tomato**).
Ann. Fac. Sci. agrar. Univ. Napoli, Portici : Ser. **3** : 1956–1957 : **22** : 221–36.

This contribution has been referred to already [XXVII, 3142].

3499 PETERSON, J. L.
The backcross method in breeding tomatoes resistant to Fusarium wilt.
Abstr. Thes. Utah St. Univ. 1957 : **5** : 25–26. (Abst.).

The F_2 of the wilt-resistant fifth back-cross progeny failed to equal the recurrent parent Loran Blood in early yield and fruit size but appeared to equal it in total yield. Probably a genetic condition such as linkage or pleiotropy was responsible for the inferiority in the first two respects.

3500 SCHROEDER, W. T. & TAPLEY, W. T.
Geneva 11—A new tomato for canning.
Fm. Res. 1958 : **24** : p. 9.

Bred at Geneva, NY, from Red Jacket and lines resistant to *Verticillium* wilt, Geneva 11 is characterized by earliness, productivity throughout the season, fruits of a good red colour and resistance to *Verticillium* wilt.

3501 FERNÁNDEZ VALIELA, M. V.
Identificación de dos razas de Lycopersicum virus 3 en el Delta del Paraná. (**Identification of two races of *Lycopersicum* virus 3 in the Paraná Delta**).
Idia 1957 : No. 116 : 22–27.

Two races, differing in the symptoms produced on tomato and on *Physalis angulata*, in lethal temperature and in incubation period, were identified. One of the races corresponds to the virus causing tip blight in the USA while the other seems to be confined to Argentina. When both races are present the symptoms of one or the other tend to be expressed rather than mixed symptoms.

3502 HOLMES, F. O.
Relationship of spotted-wilt virus in northern and southern hemispheres.
Science 1957 : **126** : p. 1232. (Abst.).

"Identification of spotted-wilt virus in the Northern Hemisphere with the Australian virus first described under that name has never been attempted by importation of virus strains for comparative study, nor have specific antisera been available. Instead, seeds of plants carrying known genes for resistance have been exchanged. Such a technique can be applied to a variety of other phytopathogenic viruses, but its availability has not been generally recognized. The number of applicable genes is now substantial. Without exception they have proved virus specific or strain specific. This technique, in contrast to transportation of the viruses themselves, is beneficial to all national interests. In the case of spotted-wilt virus, a single-gene resistance that proved effective in the eastern United States proved applicable experimentally to some strains in Australia. It was effective also in the Hawaiian Island, although less effective than a single-gene resistance developed there earlier. Both resistances were ineffectual under field conditions in Western Australia, but Finlay found that the F_1 hybrid between the two resistant stocks was resistant in the field. He showed that each parental line had contributed two additional resistance genes, one of which was common to both parents. Recognized heterogeneity of Australian strains of spotted-wilt virus may reflect efficient transmission by *Frankliniella schultzei*, a thrips confined to the Southern Hemisphere. Less efficient vectors in the Northern Hemisphere may not transmit all strains."

3503 Daskalov, H. & Murtazov, T.
[Using the method of grafting in hothouse culture of the egg plant (*Solanum melongena*)].
Izv. Inst. Rastenievădstvo (News Inst. Pl.-Industr.), Sofia 1957 : No. **4** : 65–72. [Bulgarian].

The productiveness and earliness of the egg-plant variety 12 and the hybrid 12 x Delikates [Delicacy] were improved by grafting on to the tomato hybrid Zarja [Dawn] x Komet [Comet] under hothouse conditions at Plovdiv. Moreover, the grafted plants produced a greater number of well developed parthenocarpic fruits and fewer abortive fruits than ungrafted plants when light and temperature conditions were unfavourable.

3504 Braverman, S. W.
Resistance to *Verticillium* wilt.
Fm. Res. 1958 : **24** : p. 8.

Approximately 200 introductions of *Solanum melongena* and one each of *S. gilo*, *S. indicum* and *S. ciliatum* were tested at Geneva, NY, during 1957 for their reaction to *V. albo-atrum*. About 5% of the *S. melongena* introductions as well as *S. indicum* showed possible resistance. Four introductions, PI169640 and PI169657 from Turkey, PI180485 from India and PI194166 from Yugoslavia, remained relatively free from wilt but since the data were from field observations it is possible that freedom from infection resulted from escape rather than resistance.

3505 Campbell, J. A.
Choctaw, a new bush wax snap bean.
Sth. Seedsman 1958 : **21** : No. **1** : 24, 44.

A more detailed description is given of this variety, which received an All-America Selection award for 1957 [XXVI, 3847]. It originated from a single green-podded plant from a segregating line whose parentage included Great Northern Idaho 1, US5 x Mosaic Resistant Refugee rogue, Black Valentine and World Fair x Commodore.

3506 Alpat'ev, A. V. & Muhanova, Ju. J.
(Artificial hybridization of French beans).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. **6** : 119–23. [Russian].

Flowers of *Phaseolus vulgaris* pollinated after emasculation gave no seed set at all. Pollination of young flowers without emasculation gave a set of 24% in 1955 and owing to the fact that the stigma is receptive before the stamens mature, combined with the effect of selective fertilization, 50–100% of the seedlings were hybrids. Some of the hybrids displayed heterosis in respect of yield and size of pods, size of leaves and height of plant.

3507 Lamprecht, H.
Artifizielle Umwandlung einer Spezies in eine andere. 1. Mitteilung. **(The artificial conversion of one species into another. I).**
Agri hort. genet., Landskrona 1957 : **15** : 194–206.

In reciprocal crosses between *Phaseolus vulgaris* and *Ph. coccineus* the F_1 showed reciprocal differences in some characters but were intermediate with respect to stigma form and cotyledon position, two monogenically determined specific characters. The F_2 of *Ph. vulgaris* x *Ph. coccineus* segregated into *vulgaris* and intermediate types of stigma and cotyledon with a very few sterile *coccineus* types, while the reciprocal gave intermediate and *coccineus* types but no *vulgaris* forms. It is suggested that the specific allele can be expressed only in the cytoplasm of its own species [cf. XX, 69] and is therefore not fully expressed in either the F_1 or the F_2 bearing cytoplasm derived from a female of the other species. The occurrence of a few sterile *coccineus* types in the F_2 of *Ph. vulgaris* x *Ph. coccineus* suggested that a certain amount of paternal cytoplasm is transmitted by the pollen of *Ph. coccineus* and by means of appropriate crosses between intermediate plants and plants with *coccineus* characters, *vulgaris* cytoplasm was replaced with *coccineus* cytoplasm and progeny obtained consisting of intermediate forms and true-breeding *coccineus* types only.

3508 GIMÉNEZ MARTÍN, G.
Hacia el esclarecimiento del por que de una polimorfa generación F_1. (**Towards the elucidation of the reason for a polymorphic F_1 generation**).
Genet. iber. 1957 : **9** : 225–82.

Embryo growth in the cross *Phaseolus vulgaris* x *Ph. multiflorus* was considerably more rapid and in the reciprocal considerably slower than in either of the intraspecific crosses, while testa growth in the interspecific crosses was intermediate between that of the intraspecific crosses. The lack of coordination between the rates of growth of embryo and testa led in the first cross to retardation of the embryo by the testa and the consequent formation of malformed or dwarfed F_1 plants, and in the reciprocal to placental detachment on maturity of the testa with consequent starvation of the embryo and loss of viability. These reciprocal differences are attributed to differences in the proportions of nuclear and cytoplasmic material contributed by the parents.

3509 SCHMELZER, K. & POP, I.
Die Reaktion von Gartenbohnensorten auf die Viren des Tabakmosaiks, des Südlichen Bohnenmosaiks und der Tabakmauche. (**The reaction of garden bean varieties to tobacco mosaic, southern bean mosaic and tobacco rattle viruses**).
NachrBl. dtsch. PflSchDienst., Berl. 1957 : **11** : 213–17.

Details are given of the reaction to the above viruses of 59 varieties of *Phaseolus vulgaris*, including climbing and dwarf types and three varieties of *Ph. coccineus* tested in Germany.

3510 QUANTZ, L.
Untersuchungen zur Bestimmung mosaikresistenter, überempfindlicher Gartenbohnensorten (*Phaseolus vulgaris* L.) im Labortest. [**Investigations into the determination of mosaic resistant hypersensitive varieties of garden bean (*Ph. vulgaris*) in laboratory tests**].
Phytopath. Z. 1958 : **31** : 319–30.

The method described is suitable for estimating the resistance to common bean mosaic of varieties whose resistance depends on their hypersensitivity to the virus. A young leaf is powdered on the upper surface with carborundum and some sap extracted from an infected plant is lightly rubbed in. By this process the resistance of 38 dwarf and 29 climbing varieties was estimated in 3 days; the results agreed with field observations and with results obtained using other testing procedures.

3511 BAGGETT, J. R. & FRAZIER, W. A.
The inheritance of resistance to bean yellow mosaic virus in *Phaseolus vulgaris*.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 325–33.

Data from the F_2, F_3 and BC_1 of Great Northern 31 x Blue Lake OSC21 indicated that resistance to strains W and Y of the above virus is conditioned by three, or possibly two, major recessive genes and that the type and severity of symptoms are influenced by modifiers [cf. 1032]. The data obtained by testing the reaction of the F_2 and F_3 of Montana Great Northern 43–15 (susceptible) x Great Northern 31 to strain Y showed that parental differences in response to this strain are determined by a single pair of genes without dominance, together with modifiers which affect time of appearance and severity of the symptoms.

3512 RUDORF, W.
Ein Beitrag zur Genetik der Resistenz gegen das Bohnen-Mosaikvirus 1. (**A contribution to the genetics of resistance to bean mosaic virus 1**).
Phytopath. Z. 1958 : **31** : 371–80.

In a Russian collection of wild types of *Phaseolus vulgaris*, the dwarf race Bo19 was found to be completely resistant to the Voldagsen race of the above virus. Crosses were made between Bo19 and the susceptible variety Saxa ohne Fäden [Stringless Saxa]; back crosses were made to both parents. Segregation in the F_2 progeny indicated that the parent types differed in respect of two of the genes controlling resistance to virus 1. Saxa ohne Fäden had the genotype *ASi* and Bo19 had *asi*. By crossing Bo19 with Top Crop, the latter was found to have the genotype *AAssII*; Top Crop has the hypersensitive type of resistance to virus 1. Bo19 is also resistant to *Phytomonas medicaginis* var. *phaseolicola*.

3513 Kawatei, K. & Tsuchiya, T.
(Studies on cowpeas. I. Agronomic classification of cowpeas. I).
Shinshu Daigaku Kiyo. Nogakubu/J. Fac. Agric. Shinshu Univ. 1952 : No. 2 : 209–19. [Japanese].

A collection of 35 varieties was classified into 7 varietal groups on the basis of differences in habit, vegetative period, and the morphology of the leaves, pods and seeds.

3514 Shimizu, S., Tsuchiya, T. & Kawatei, K.
(Studies on cowpeas. II. On the chemical composition and utility of cowpeas. I).
Shinshu Daigaku Kiyo. Nogakubu/J. Fac. Agric. Shinshu Univ. 1952 : No. 2 : 221–34. [Japanese].

A collection of 34 varieties was studied and information is given on the content of protein, fat, starch, ash, phosphorus, calcium, and thiamin in the seeds and protein and starch content of the foliage. The variety Bijin [Beauty] has a thiamin content of 1200 γ per 100 g. in the seeds.

3515 Shimizu, S., Tsuchiya, T. & Kawatei, K.
(Studies on cowpeas. III. On the chemical composition and utility of cowpeas. II).
Shinshu Daigaku Kiyo. Nogakubu/J. Fac. Agric. Shinshu Univ. 1952 : No. 2 : 235–44. [Japanese].

Data are provided on the dimensions of the starch grains, rate of absorption of water by the seeds and flavour of 34 varieties. Starch-grain dimensions and flavour appeared to be unrelated but connexions were noted between quality, on the one hand, and plant habit and rate of water absorption by the seed, on the other.

3516 Barrie, A. G.
Cowpeas resistant to wilt.
Cane Gr. quart. Bull. 1957 : **21** : 39–41.

Tabulated data are included showing the percentage survival of 18 cowpea varieties in field trials at the Northern Sugar Experiment Station, Queensland, under severe attack by wilt, caused by *Phytophthora* sp. Black Eye 5, CPI12153 and CPI92594G showed 100% survival in two plantings at different dates. Malabar Pea and Soutter showed excellent resistance when planted early but poor resistance in the later-planted trial. Breeding for resistance is to be carried out.

3517 Seif, R. D.
Optimum field plot size and shape for lima bean yields.
Diss. Abstr. 1957 : **17** : Publ. No. 22, 212 : 1850–51. (Abst.).

Uniformity trials with the variety Fordhook 242 were undertaken to ascertain optimum plot size and shape for estimating bean weight, green-plant weight and number of marketable pods. For varietal trial cost data, the optimum plot size was 34 ft.^{2} for bean weight and about half this value for green-plant weight. The least between-plot variance resulted from long narrow plots orientated along the fertility gradient.

3518 van Schaik, P. H. & Probst, A. H.
The inheritance of inflorescence type, peduncle length, flowers per node, and percent flower shedding in soybeans.
Agron. J. 1958 : **50** : 98–102.

A detailed account is given of investigations already briefly reported [XXVII, 1336].

3519 Klykov, A. P.
(An important question. Introduce the soya bean more boldly into the Nonchernozem Zone!)
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1957 : No. 12: 23–26. [Russian].

Mention is made of early-ripening forms, with a yield of 6·8–12·0 c. seeds and 204–266 c. of green matter per ha., from the Rjazan Agricultural Institute. They were obtained by selecting seed of unspecified varieties originating from the Kubanj for slow rate of swelling on soaking.

3520 van Schaik, P. H.
Inheritance of inflorescence type and a study of environmental factors affecting flower shedding in soybeans.
Diss. Abstr. 1957 : Publ. No. 21,319 : 1442–43. (Abst.).

From a study of six crosses between four varieties it was found that the pedunculate type of inflorescence differed from the sessile by one factor pair (*Sese*). Inflorescence type was independent of growth habit and flower colour but closely associated with plant height and time of maturity.

Genes conditioning long peduncle, high number of flowers per node and high percentage of flower shedding were partially dominant, heritability estimates being high for the first two of these characters but low for the last. Estimates of gene numbers were lowest for peduncle length and highest for shedding percentage. All estimates were however considered to be too low since the requirements for the application of the Castle-Wright formula were not fulfilled. Shedding percentage depended upon additive gene action. Gene-action determinations were inconclusive in the case of peduncle length and flower number. Highly significant and positive correlation coefficients were obtained between peduncle length and flower number and between flower production and percentage lost by shedding. Correlation coefficients between numbers of flowers and pods per node were inconsistent in the various crosses; high production of flowers did not therefore necessarily contribute to high yield. Failure of pollination and fertilization were considered to be two major causes of flower and pod shedding.

3521 LEHMAN, S. G.
Physiologic races of the downy mildew fungus on soybeans in North Carolina.
Phytopathology 1958 : **48** : 83–86.

Isolates from seed of soya bean infected by *Peronospora manshurica*, collected in North Carolina, have yielded four new races of the pathogen, designated 3A, 5, 5A and 6. The reaction of 37 varieties to these races has been determined and a set of ten differential varieties is suggested by means of which all known races may be determined. Nine of the varieties tested showed no symptoms of infection when inoculated with the new races.

3522 ROSS, J. P. & BRIM, C. A.
Resistance of soybeans to the soybean cyst nematode as determined by a double-row method.
Plant Dis. Reptr. 1957 : **41** : 923–24.

Resistance to *Heterodera glycines* was found in Ilsoy, Peking, PI189920, PI189969, PI79693, PI90763, PI209332 and PI84751, when approximately 2800 selections and varieties were tested at the North Carolina Agricultural Experiment Station, Raleigh, NC.

3523 LAMPRECHT, H.
Eine neue Blütenfarbe von *Pisum*, mit einer Übersicht über bisher bekannte Blütenfarben und deren genische Bedingtheit. **(A new flower colour in *Pisum* together with a survey of previously known flower colours and their genic determination).**
Agri hort. genet., Landskrona 1957 : **15** : 155–68.

After an account of the flower colour light mauve, found in plants with the genotypic constitution *A Am ar B cr Ce*, a survey of all previously described genes for flower colour in *Pisum* is presented.

3524 LAMPRECHT, H.
Dominantes Drabgrau, eine neue genbedingte Testafarbe bei *Pisum*. **(Dominant drab grey, a new gene-conditioned testa colour in *Pisum*).**
Agri hort. genet., Landskrona 1957 : **15** : 207–13.

The spontaneous appearance of a new dominant gene *Ca* (from *caneo*) conditioning a drab grey testa colour in the F_3 of a pea cross is described. The gene appears to act only in the presence of the genes *z*, *mp*, *cal* and *dem* or *Dem*, all governing partial testa coloration, and is unaffected by the dominant or recessive alleles of *Am* and *B* for flower colour.

3525 LAMPRECHT, H.
Über die Vererbung der Hülsenbreite bei *Pisum*. **(On the inheritance of pod width in *Pisum*).**
Agri hort. genet., Landskrona 1957 : **15** : 105–14.

The following recessive genes have been studied: *te* and *laf*, which individually reduce pod width by about 25% and together by about 35% [cf. XXIII, 3118 and XXV, 2532]; *lt*, which increases pod width by about 25%; and *n*, which effects a reduction of about 25% in pod width in both *lt* and *Lt* pods. In linkage studies of nine genes, *Lt* was situated on chromosome VI, showing crossing-over values of 25·5 and 29·5% with *P* and *Wlo* respectively. No linkage relationships were established for either of the complementary genes *Br* and *Bra* which together govern bracteole development.

3526 LAMPRECHT, H.
Die Genenkarte von Chromosom VI und das Interchange der Chromosomen IV/VI von *Pisum*. **(The gene map of chromosome VI and the interchange between chromosomes IV and VI of *Pisum*).**
Agri hort. genet., Landskrona 1957 : **15** : 115–41.

On the basis of earlier work and the results of 17 new crosses the probable order *Wlo—Lm—P—Lt—Pl—Fl* is established for chromosome VI. Variations in crossing-over values occurred, being greater for genes situated near the ends of the chromosome, and it was found that genotypic background had a marked influence on the cross-over values obtained between *Pl* and *Fl*. Analysis of two crosses involving line 58 allowed the position of an interchange in this line between chromosomes

IV and VI to be demonstrated. A marked reduction in crossing-over frequency was found in the neighbourhood of the point of breakage.

3527 LAMPRECHT, H.
Durch Röntgenbestrahlung von *Pisum*-Samen erhaltene neue und bekannte Genmutationen. (**New and previously known gene mutations obtained by X irradiation of *Pisum* seeds**).
Agri hort. genet., Landskrona 1957 : **15** : 142–54.

The following new X-ray mutants have been obtained: *aureovirescens*, determined by the gene *auv*, the leaves between about the seventh and tenth nodes becoming yellowish; *sine vexillum* (*siv*), in which the flowers of the first few inflorescences lack the standard and are sterile; *coeruleovirens* (*cov*), giving a dark bluish-green colour to the plant together with a reduction in height and vigour; *minutus* (*min*), resulting in an overall diminution in size; and the *magnus* type (*ma*), with extra large seeds. In addition, mutant types conditioned by a number of previously described genes have been observed and also mutants showing various chlorophyll defects and aberrations of growth, the genic basis of which has not been determined.

3528 LAMPRECHT, H.
Röntgeninduzierte spezifische Mutationen bei *Pisum* in ihrer Abhängigkeit von der genotypischen Konstitution. (**X-ray induced specific mutations in *Pisum* and their dependence upon genotypic constitution**).
Agri. hort. genet., Landskrona 1957 : **15** : 169–93.

Lines 21, 58, 379 and 680, carrying the respective translocations I/VII, IV/VI, III/V and V/VII, showed significant differences both in loss of viability and in type of mutation induced by X irradiation of the seeds. The mutant genes *auv* and *siv* [cf. 3527] appeared in lines 680 and 58 respectively and each mutated to the dominant allele during plant growth. In lines 21, 58 and 379 specific structural mutations involving different interchanges were induced. The mutations described are regarded as typical position effects resulting from the translocations in the parental line.

3529 NICOLAISEN, N.
Die Anwendung des Texturemeters in der Erbsenzüchtung. (**On the use of the texturemeter in pea breeding**).
Saatgutwirtschaft 1957 : **9** : 178–80.

By means of a texturemeter the resistance to pressure of seeds may be determined and the quality of seed from different varieties at various stages of development may be compared. In three varieties of pea, marked differences were found in the relation between seed size and texturemeter value.

3530 JOHNSON, K. W.
Inheritance studies in *Pisum sativum* L.
Diss. Abstr. 1957 : **17** : Publ. No. 22,369 : p. 1862. (Abst.).

As indicated by data from crosses of the susceptible varieties Perfected Wales and Thomas Laxton with the resistant New Era, Pride, Wisconsin Early Sweet and Wisconsin Perfection, resistance to bean virus 2 depended upon a single recessive gene which was independent of the gene for internode length.

Inheritance of quantitative characters was studied in Alaska x Wisconsin Early Sweet, Alaska x Wisconsin Perfection and Black-Eyed Susan x Wisconsin Early Sweet. Genes for low yield, number of peas, number of pods and average seed weight were partially dominant. All four characters showed heterosis and transgressive segregation. Flowering time and number of nodes to the first pod were probably determined by one or two major genes, plus partially dominant modifiers for late flowering and high number of nodes. Internode length was controlled by one or two major genes with a pleiotropic effect on height. Total number of nodes appeared to be influenced by modifiers partially dominant for high number. Heterosis in height was attributed to the over-all positive increment due to the increased vigour of the F_1. Heritability values and genetic gains were, in general, low to intermediate in Alaska x Wisconsin Early Sweet and intermediate to high in the other two crosses. It was concluded that selection would be effective in improving yield, number of peas, number of pods, average seed weight, height, flowering time and number of double pods, in comparison with the more desirable parent in these respects. Individual-plant variation in yield was primarily due to variation in number of pods and total number of peas; these three characters were probably pleiotropic expressions of the same genes.

3531 AIDA, H. & UEHARA, T.
(**Ecological investigations on vegetables in warm regions. I. The response of Okuzure peas to low temperature**).
Kanagawa Nogyo Shikenjo Engeibunjo Kenkyu Hokoku/Bull. hort. Br. Kanagawa agric. Exp. Sta. 1957 : No. 5 : 43–48. [Japanese].

Four red-flowered varieties were studied, two from the Okuzure coast and two from the Izu islands. Low-temperature pretreatment of the seeds depressed the growth of all varieties except Mitsuya from the Izu islands. The Izu varieties were earlier and much better yielders than the Okuzure forms.

3532 CHAUDHARY, B. B. & ARGIKAR, G. P.
Occurrence and inheritance of the *fasciculifolia* form in *Cicer arietinum* L.
Curr. Sci. 1957 : **26** : 395–96.

Segregation in the F_2 and F_3 of crosses among normal plants, *gigas* mutants, tiny-leaved mutants and *fasciculifolia* mutants [XXIII, 3121] indicate the action of a single gene pair in determining each leaf form. The genotypes of the four examples under investigation are thought to be $S_{\mathrm{lv}}\ S_{\mathrm{lv}}\ T_{\mathrm{lv}}\ T_{\mathrm{lv}}\ N_{\mathrm{lv}}\ N_{\mathrm{lv}}\ G_{\mathrm{lv}}\ G_{\mathrm{lv}}$, $S_{\mathrm{lv}}\ S_{\mathrm{lv}}\ T_{\mathrm{lv}}\ T_{\mathrm{lv}}\ g_{\mathrm{lv}}\ g_{\mathrm{lv}}$, $S_{\mathrm{lv}}\ S_{\mathrm{lv}}\ t_{\mathrm{lv}}\ t_{\mathrm{lv}}\ N_{\mathrm{lv}}\ N_{\mathrm{lv}}\ G_{\mathrm{lv}}\ G_{\mathrm{lv}}$ and $S_{\mathrm{lv}}\ S_{\mathrm{lv}}\ t_{\mathrm{lv}}\ t_{\mathrm{lv}}\ N_{\mathrm{lv}}\ N_{\mathrm{lv}}\ g_{\mathrm{lv}}\ g_{\mathrm{lv}}$ respectively. [Cf. XVII, 1011 and XXIV, 3496].

3533 DE, H. N., BOSE, B. C. & VIJAYVARGIYA, B. L.
Mechanism of induction of polyploidy by colchicine. Part I—Biochemical studies in gram (*Cicer arietinum*) after induction of polyploidy by colchicine.
Arch. int. Pharmacodyn. 1957 : **109** : 457–61.

BOSE, B. C., DE, H. N., GUPTA, S. S. & BHASKARAN, S.
Mechanism of induction of polyploidy by colchicine. Part II—Cytochemical studies on dehydrogenase activity in gram (*Cicer arietinum*) after induction of polyploidisation by colchicine.
Ibid. 1957 : **109** : 462–67.

Both diploids and colchicine-induced polyploids showed an increase in succinic and malic dehydrogenase activity from the first to the seventh day after germination, the diploids showing a higher rate of activity for both enzymes. The distribution of enzyme activity was similar in both seedling types.

3534 HAFIZ, A. & ASHRAF, M.
Association of morphological characters in gram plants with blight reaction.
Agriculture, Pakistan 1957 : **8** : No. 1 : 1–4.

A strong positive correlation has been found between hair density and blight resistance, a weak positive correlation between plant height and resistance, and a weak negative correlation between number of tertiary branches and resistance in studies of F8 and F10, from France, P7 and C7 from the Punjab and P7 x F8.

3535 SOLOMON, S., ARGIKAR, G. P., SALANKI, M. S. & MORBAD, I. R.
A study of heterosis in *Cajanus cajan* (L) Millsp.
Indian J. Genet. 1957 : **17** : 90–95.

Data are given on a number of quantitative characters of ten F_1 hybrids of *Cajanus cajan* studied at Bijapur. Increases in grain yield of up to 24·51% over that of the parents were obtained but the best yielding hybrid gave a lower yield than the best parental type.

3536 VAHEEDUDDIN, S.
Selection of tur (*Cajanus cajan* L) resistant varieties against wilt (*Fusarium udum* Butler).
Agric. Coll. J. Osmania Univ. 1956 : **3** : 12–13.

Selection at Sangareddy, Hyderabad State, has resulted in the varieties ST1, ST2 and ST3 which yield two to two and a half times more than the local type and exhibit a high degree of resistance to *F. udum*.

3537 LANA, E. P., HABER, E. S. & LI, C. C.
Comparison of linecrosses with inbreds and linecross hybrids with single cross hybrids in sweet corn.
Proc. Amer. Soc. hort. Sci. 1957 : **70** : 297–307.

The term line cross refers to a hybrid between two closely-related inbreds, while a combination of a line cross with an unrelated inbred or line cross constitutes a line-cross hybrid. Using the single-cross canning hybrids Golden cross (P39 x 51T), Iona (P39 x I45B) and Iochief (5125I x 453 or 5125I x 469) and their parental inbreds, a comparison was made of inbreds *vs.* line crosses and single-cross hybrids vs. line-cross hybrids with respect to number of days to emergence, number of days from sowing to the appearance of the first silk, gross weight of ear, weight of ear after removal of husk, ear length, depth of kernels as removed from the cob by the canner, and row number per ear. A determination was also made of the variability within inbreds and single-cross hybrids as respectively compared with the corresponding line crosses and line-cross hybrids. Two types of line crosses were studied, involving (1) selections extracted from homozygous inbreds (P39 or 5125I) and (2) inbreds 453 and 469 which were developed from the first self-pollinated generation after the second back cross of P39 x 45 to 45 and which were still segregating. The line cross 453 x 469 exhibited heterosis in length and gross and net weight of the ear. Seedsmen may therefore find it advantageous to use this type as ♀ in producing line-cross hybrids. No definite trends in the comparisons made could be detected. It was concluded that line-cross hybrids may be expected to equal the usual type of single cross in field and processing performance and may be used by seedsmen in the production of hybrid seed.

3538 Erwin, D. C. & Cameron, J. W.
Susceptibility of five sweet corn varieties to *Pythium graminicola*.
Plant Dis. Reptr. 1957 : **41** : 988–91.

Although the inbreds Purdue 39A, Purdue 51B and Iowa 2000 appeared to be more resistant to *P. graminicola* in the field than inbred Wisconsin 23 and the open-pollinated variety Luther Hill, they exhibited marked susceptibility in greenhouse tests.

3539 del Valle, C. G. & Hidalgo Gato, E.
El maíz de rosita. (**Popcorn**).
Bol. Estac. exp. agron. Cuba 1954 : No. 71 : Pp. 24.

After studying a number of popcorns introduced into Cuba from Iowa and Texas, crosses were made between a Texas line and the local maize Provincia PF(MS)$_5$, between an Iowa line and a mutation found locally and between two popcorn mutants from ordinary Cuban maize. The last cross has, after selection over seven generations, given rise to a pure popcorn which under Cuban conditions is vigorous and resistant to the effects of wind and heavy rain. In the eighth generation selection of inbred lines was started and after three generations of selfing four lines were crossed to form two single crosses; these were more uniform and popped better than the parent variety but were deficient in vigour and yield; they are therefore being crossed with lines selected from the other two hybrids referred to above.

3540 Weaver, B. L. & Thompson, A. E.
White hulless popcorn : fifteen generations of selection for improved popping expansion.
Bull. Ill. agric. Exp. Sta. 1957 : No. 616 : Pp. 19.

The recurrent selection programme described in this bulletin was carried out between 1939 and 1953 at the Agricultural Experiment Station of the University of Illinois. The mean popping expansion increased from 22·2 volumes to 35·8 volumes with a nearly linear increase shown by the last eight generations. A similar increase was shown by the lowest and highest samples while the variability within the total population decreased. A consistent negative correlation was found between popping expansion on the one hand and width and weight of ear, weight of shelled corn and shelling percentage on the other but it was not considered of sufficient importance to be of value in selection or prediction. Pointed kernels yielded an average expansion of 1·69 volumes higher than rounded kernels.

3541 Chládek, M. & Košová, V.
Vyšlechtění nové výnosené odrůdy tymiánu obecného (*Thymus vulgaris* L.).
[**The breeding of a new productive variety of common thyme (*Th. vulgaris* L.)**].
Sborn. čsl. Acad. zeměd. Věd: Řada rostlinná Vyroba 1957 : **30** : 1099–110.

An account is given of single plant selection of a local strain at Pohořelice. Several clones with high yields of green and dry matter from two cuts and with high contents of essential oil and phenols were obtained.

3542 Nagasawa, T.
(**Studies on the progress achieved with Japanese mint. V. Studies on Beni mint**).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. exp. Sta. 1954 : No. 50 : 1–34. [Japanese]

Extensive details are provided on the yield, oil production and chemical composition of the oil of *Mentha* varieties under trial in Japan. Attention is drawn to the variety Beni [Red], to be designated in future Sambi [Attractive in Three Ways], which is distinguished by vigorous growth, high yield, high oil content and high proportion of menthol in the oil.

3543 Chamura, S.
(**On the characteristics of the new mint variety Sambi**).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. exp. Sta. 1954 : No. 50 : 35–58. [Japanese].

The first part of this paper comprises a comparative taxonomic and biometrical study of Japanese and introduced varieties and a report of their yielding capacity and oil production. The second part provides further information on the superior qualities of the variety Sambi, referred to in the preceding abstract.

3544 Chamura, S.
(The relation between the flowering of mint, on the one hand, and photoperiod and temperature, on the other).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. exp. Sta. 1954 : No. 50 : 59–68. (Japanese].

Introduced European and American varieties, principally grown in Hokkaido, were found to be long-day plants; a slight shortening of the period of flowering usually resulted from an increase in temperature. Most of the Japanese varieties are only slightly responsive to photoperiod and flowering is usually delayed by increased temperature. The Japanese variety Hokushin [Gift to the North], grown in northern Japan, is a long-day variety whose flowering is only slightly retarded by high temperature.

3545 Graham, R. A.
Mint notes. VI. *Mentha* x *verticillata* var. *trichodes* Briquet.
Watsonia 1958 : **4** : 70–71.

The author considers the above variety from Gower, S. Wales, to be an aberrant form of *M. gentilis* (*M. arvensis* x *M. spicata*).

3546 Graham, R. A.
Mint notes. VII. *Mentha* x *maximilianea* F. Schultz in Britain.
Watsonia 1958 : **4** : 72–76.

Putative hybrids of *M. aquatica* x *M. rotundifolia* are described.

3547 Ikehata, Y., Nakayama, T. & Ando, S.
(The classification of developmental types of mint for warm regions and their physiological and ecological characteristics).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : 61–62. [Japanese].

Comparative physiological and ecological studies were made of eight Japanese varieties differing in degree of resistance to drought. Resistance was associated with deep roots, rapid root growth before the dry season and high content of hydrophilic colloids as measured by absorption of malachite green or eosin. Plant height and root depth are closely correlated. Okako 2 [Okayama Hybrid 2] is mentioned as highly resistant.

3548 Sharma, A. K. & Datta, P. C.
Artificial polyploidy in coriander (*Coriandrum sativum* L.)
Caryologia 1957 : **10** : 152–58.

Tetraploid plants, larger and darker in colour than diploids, have been produced at Calcutta University Botanic Garden by colchicine treatment of young seedlings. Meiotic irregularities were observed, seed setting was found to be poor and so far no polyploid seed has been successfully germinated.

ECONOMIC LOWER PLANTS

3549 Imšeneckij, A. A.
(Forty years' study of variability of microorganisms in the USSR).
Mikrobiologija (Microbiology), Moskva 1957 : **26** : 632–50.

This general survey of Soviet research in the period from 1917 to 1957 deals with such topics as induction of mutations, directed variability, production of new characters by mixed culture, the use of DNA for transformation and breeding techniques.

3550 Ruokola, A.
Torajyvän viljelykokeista Viikin koetilalla ja eräillä kasvinviljelyskoeasemilla Suomessa. **(Cultivation experiments on ergot at the Viik trial ground and other Finnish agricultural experimental stations).**
Maataloust. Aikakausk. 1956 : **28** : 203–22.

Native and introduced strains of ergot have been reared on different rye varieties at several experimental stations in Finland. Extensive data are presented concerning rate of development, yield and alkaloid content obtained in a series of experiments conducted during 1952–55.

3551 Buck, C. E.
Variations produced in *Saccharomyces cerevisiae* by beta particles from radiophosphorus.
Abstr. Diss. Ohio Univ. 1950–51 : No. 67 : 131–36.

Eighty-three diploid selections, differing from the nonirradiated parents in colonial and morphological characters, were obtained as the result of treatment of two commercial strains with P^{32}. Five selections produced ethanol at a more rapid rate than the parents in a 20% sucrose yeast-extract medium; two did not give rise to a detectable amount of ethanol. Fourteen selections differed from the corresponding parent and from one another in nutritional requirements.

3552 de Robichon-Szulmajster, H.

Induction of enzymes of the galactose pathway in mutants of *Saccharomyces cerevisiae.*

Science 1958 : **127** : 28–29.

One of the two haploid mutants studied was considered to be galactocinaseless (g_1G_2), while the other (G_1g_2) appeared to be defective in a system involved in the transport of galactose. Galactocinase activity was present in G_1g_2 cells as the result of induction by galactose but was always completely absent in g_1G_2 cells. Galactocinase activity is therefore under the control of G_1. The role of G_2 in the transport of galactose is under investigation. With the addition of galactose to cells growing on a glucose-salts medium or to cells suspended in buffered acetate solution, synthesis of galactose enzymes took place even in the galactocinaseless mutant. Although α-galactose-1-phosphate, the normal substrate for α-galactose-1-phosphate uridyl transferase, was not formed by the g_1G_2 mutant, or at least not in detectable amounts, this enzyme and the subsequent enzyme, uridine diphosphogalactose-4-epimerase, were nevertheless induced. It is postulated that free galactose itself acts as an inducer of the synthesis of two successive enzymes in the pathway of galactose fermentation in the g_1G_2 mutant.

3553 Royan, S.

Evaluation of staining procedures following fixation of yeast in iodine formol acetic solution.

Proc. Indian Acad. Sci. 1958 : **47** : 31–42.

Fixation of *Saccharomyces cerevisiae* for 60–90 min. in diluted Gram's iodine + formaldehyde + glacial acetic acid, and extraction of RNA by hydrolysis in N HCl at 60° C. or 10% perchloric acid at 28° C. proved to be satisfactory. The structure of the nucleus as observed in hematoxylin preparations corresponded with that seen in living cells under the phase-contrast microscope. In Feulgen preparations only a limited area of the nucleus was stained. With regard to the area of the nucleus stained, the Giemsa technique was intermediate between the Feulgen and hematoxylin methods. The nucleus occupied an extravacuolar position. The vacuole was Feulgen negative.

3554 Thyagarajan, T. R.

The reaction of the vacuole and the nucleus of living yeast to neutral red.

Curr. Sci. 1958 : **27** : 28–29.

Observations on living vegetative cells and zygotes of *Saccharomyces carlsbergensis* stained with neutral red indicated that the nucleus is situated outside the vacuole.

3555 Santa María, J.

Sobre especies pluriesporuladas del género *"Saccharomyces"*. (**On polysporous species of the genus *Saccharomyces***).

Bol. Inst. Invest. agron., Madr. 1957 : **17** : 231–38.

Two strains of *S. cerevisiae* and one of *S. delbrueckii*, each producing more than four spores per ascus, have been isolated.

3556 Katô, S. & Nishikawa, N.

Studies on flocculation of brewers' yeast. I. A new method for determination of flocculating power and a comparative survey of various strains.

Bull. Brew. Sci., Tokyo 1957 : **3** : 39–51.

Values for the flocculating power of a series of Japanese and English yeasts were determined. Strains derived from single-cell isolates of the Japanese strain 2023 ranged from 0·7 to 11·4 in flocculating power.

3557 Kocková-Kratochvílová, A. & Drobnica, L.

Roztřídění vinných kvasinek. (**A classification of wine yeasts**).

Preslia 1957 : **29** : 269–77.

Yeast strains investigated at Bratislava were found to have (1) circular cells when they were isolated from heavy wines, (2) oval cells when isolated from table wines and (3) elongated cells from the sparkling wines. The strains with circular cells were the most tolerant of high alcohol content in the substrate and fermented sweet juices at a greater depth. The strains with elongated cells on the other hand were the best in completing fermentation. Yeast strains isolated from fresh grapes had neither the morphological nor fermenting properties of the yeasts selected from wines and pertained either to the first or second, but not to the third of the above mentioned groups. It is thought that the last group arose through artificial selection.

3558 Ramakrishnan, C. V., Raina, P. N. & Gadgil, M. V.

X-ray mutants of *Torulopsis utilis* var. *major*.

Naturwissenschaften 1958 : **45** : 19–20.

Irradiation with 20,000 r. produced a strain of *T. utilis* var. *major* which grew faster than the untreated yeast. A culture of this mutant was kept at 60° C. for 30 min.; the survivors grew more slowly than the original mutant and lacked its peculiar odour and taste. Another mutant obtained by irradiation with 360 r. grew more slowly than the normal form.

BOOK REVIEWS

3559 Mudra, A.
Statistische Methoden für landwirtschaftliche Versuche. (**Statistical methods for agricultural experiments**).
Paul Parey, Berlin & Hamburg 1958 : DM 58.60 : Pp. viii + 336 : 38 figs. : tables.

Professor Mudra has been one of the foremost advocates in Central Europe of the use of Anglo-American statistical methods for evaluating field trials. His introductory book on this topic appeared in 1952 and was reviewed in this journal [XXIV, p. 480]. The present volume is more advanced than its predecessor but is still designed to be of use for the reader disinclined for much mathematics though desirous of using statistical methods correctly.

The text is divided into three sections. The first is concerned with the general principles of statistics and includes chapters on sampling, mean and variance, the binomial and normal distributions, the t and F tests, analysis of variance, correlation, regression, covariance and χ^2. The second section describes the setting up and analysis of the commoner experimental designs, namely randomized blocks, the Latin square, lattices, balanced-incomplete designs and Youden squares, factorial experiments, split-plot designs and experiments variously replicated in time or space. A number of miscellaneous topics are brought together in the last section, in particular missing-plot techniques, tests for normality and scale transformations. A set of statistical tables completes the volume. For German readers desiring a general but not searching insight into statistical methods this volume should prove highly useful.

3560 Snyder, L. H. & David, P. R.
The principles of heredity.
D. C. Heath & Co., Boston 1957 : 5th Ed. : $6.25 : Pp. xi + 507 : figs. : tables.

The second edition, which appeared in 1940, was reviewed in *Plant Breeding Abstracts* [X, p. 251]. With each successive edition, revisions have been made to cover the most important new developments in genetics. As the result of the accumulated revisions, the fifth edition, compared with its predecessor of 1940, may be described as a more general introduction to genetics, useful to those interested in either plants or animals, although the emphasis is still on heredity in man and animals. New features in the latest edition include the following. The genetics of bacteria and viruses is dealt with in a separate chapter, which is integrated with the neighbouring chapters on cytoplasmic inheritance and on genes and development. Pseudoallelism is now discussed in the last-mentioned chapter. The account of chromosome aberrations has been divided into two chapters, one dealing with variations in chromosome number, the other with structural rearrangements. A discussion of recent research on the structure and genetic significance of DNA has been incorporated in the chapter on genes and mutations; further consideration of the genetical implications of DNA appears in the already-mentioned chapter on bacteria and viruses. Some rearrangements of the chapters have been effected and chapters on the physical background of Mendelian inheritance, sex-linked genes, linkage and chromosome mapping, the cytological basis of crossing over and sex determination have been extensively rewritten. Additions concerning biochemical aspects have been inserted in several chapters, apart from those in the chapter on genes and development. The chapter dealing with methods of breeding crops and livestock has been expanded. New illustrations have been added and students will find a large number of new problems set for them.

3561 Demerec, M. (Editor).
Advances in genetics. Vol. IX.
Academic Books Ltd., London 1958 : $8.80 : Pp. viii + 294 : figs. : tables.

Unlike previous issues [cf. XXVI, p. 696], this volume devotes all but one of the contributions to studies in the vegetable kingdom. After a study of The population genetics of *Drosophila robusta*, we pass to The genetics of Basidiomycetes, by H. P. Papazian, who for reasons of convenience rather than logic chooses to exclude the rusts and smuts from the review. A more or less complete account is given of the spontaneous and induced mutations that have been found in the group as so narrowed down. These together with studies of segregation in other characters reveal the occurrence of linkage with a frequency corresponding to about 4 chromosomes. Some cases of irregular segregation of the incompatibility factor are described, one of which shows affinity with the phenomena of conversion and transduction in other organisms. Most instances of extranuclear inheritance are rather indefinite.

In Genetic analysis based on mitotic recombination, G. Pontecorvo and E. Käfer demonstrate the use of mitotic crossing-over and haploidization for chromosome mapping in

Aspergillus nidulans, as illustrating its possible use in organisms without sexual reproduction. The results show that mitotic crossing-over, besides having in *Aspergillus nidulans* an absolute incidence per mitotic nucleus over 1000 times smaller than that of meiotic crossing-over per meiotic nucleus, has also a different relative distribution along the chromosomes; in certain regions it is greater than in meiotic crossing-over. It is however suggested that mitotic analysis might also be applicable to the higher organisms, possibly in tissue cultures. In an 8-chromosome map of *Aspergillus nidulans*, E. Käfer gives more details of the use of mitotic segregation, combined with meiotic analysis, for the establishment of linkage groups in this organism. A table is given showing all mutants located up to March 1957 and the characters that have been placed in each of the first four groups are discussed; there follows an account of the successive establishment of four further groups. The existence of the eight groups seems to conform to cytological evidence which, though unpublished, is cited. Details are then given concerning the position of the markers and of the centromere in each group. As in the researches reported in the preceding contribution, mitotic crossing-over was found to be most frequent in an area near the centromere but the maps established by mitotic and meiotic segregation are in good agreement.

In The inviability, weakness and sterility of interspecific hybrids, G. L. Stebbins takes examples from both plant and animal kingdoms. The factors making for hybrid inviability or weakness are considered under the headings of incompatibility between parental chromosomes and genes, incompatibility involving cytoplasmic and plastid differences and incompatibility between embryo and surrounding tissue. Next the causes of hybrid sterility are examined; the difficulties of distinguishing between genic and chromosomal sterility are pointed out and only three main categories are discussed, viz. diplontic genic sterility, diplontic sterility due to disharmony between genome and cytoplasm, and haplontic sterility; the frequency of plant hybrids in which sterility results from structural differences in the chromosomes is contrasted with their rarity in animals; the haplontic sterility in hybrids between *Oryza sativa* subspp. *indica* and *japonica* is thought to be more probably associated with rearrangements of chromosomal segments which are so small that they contain perhaps only one to five genes, than to pure genic effects as suggested by Oka [XXVI, 2402]. From a consideration of all the data examined the general conclusion is reached that any effective barrier that separates valid species consists of many different genetic factors; in some cases these may be predominantly gene differences at particular loci, in others they may consist predominantly of structural chromosome differences but in the majority of cases both types of difference are involved. These may or may not be linked or otherwise associated with morphological differences between the species. In spite of isolated examples which might be taken to prove otherwise, for which alternative interpretations are presented, the author adheres to the view that species barriers have been built up gradually by natural selection; diverging ecological adaptation, isolation of populations divergent in chromosome structure, and the selective disadvantage of forms producing many sterile or partially sterile hybrids are the suggested mechanisms by which the barriers arise or are reinforced. Structural diversity in chromosomes has apparently played a subsidiary role in speciation in animals and in trees and shrubs, and is relatively common in short-lived herbaceous plants. New sterility barriers also arise as the result of segregation from interspecific hybrids.

In The mechanism of sex determination in dioecious flowering plants, M. Westergaard reviews the cases in which the existence of heteromorphic sex chromosomes has been demonstrated in plant species and the results of hybridization between forms differing in sex type in a number of different species. It is shown that in *Melandrium* and certain other species, unlike *Drosophila*, *Rumex acetosa* and many other organisms, the Y chromosome is decisive in determining sex; by a study of fragmented Y chromosomes in *Melandrium* it has been possible to identify three different regions, each with a separate function in sex determination. If the distal part is absent, bisexual plants result, if the other arm is absent, sterile males and if the whole Y chromosome, females result. This situation is interpreted as "complete linkage between genes (or a gene), which suppresses female development and genes which initiate and complete anther development". The substance (hormone?) produced by the Y chromosome can be however provided by *Ustilago violacea*, since female plants infected by this organism develop anthers. The female potencies are developed under the influence of the X chromosome and some of the autosomes. It is shown how this scheme, with or without small modifications, will explain the situation in other genera such as *Ecballium* and

Carica, and this type of control is considered to be transitional between a primitive Y type and a secondary X/autosome type. No reason is found for regarding the sex mechanism as in any way different from other genetically controlled systems, as is still done by Hartmann [XXVI, p. 527] and others.

The volume would have benefited by a little further editing; though it bears the date 1958, some of the contributions in it are referred to under 1957, the standard of typographical accuracy in the contribution by Westergaard is quite unusually low for a work of this kind and some of the other contributions leave much to be desired.

3562 DARLINGTON, C. D.
Evolution of genetic systems.
Oliver & Boyd, Edinburgh & London
1958 : 21s. : Pp. x + 265 : 35 figs.

The first edition of this book appeared in 1939 [cf. IX, p. 253]. The present edition, though adhering to the basic plan of its predecessor, has been extensively revised; much new material and a number of new references have been added and some rearrangement of the older material has been effected. The impact of the events of the past twenty years is recognized by substituting Lucretius for Engels in the opening quotation.

The principal changes are as follows. A fuller account of inert chromosome segments and heterochromatin is given in chapter 9. Recent advances in nuclear biochemistry are described in chapter 10. In chapter 11, the recent trend of establishing subcategories of the gene is followed, without however any marked clarification of the issues involved. Nuclear self-control receives special attention in chapter 14 and a more detailed treatment is given of genetic isolation and mating systems in chapter 16. Sex-ratio determination is considered in chapter 18 on the Evolution of sex and recent advances in the study of apomixis are discussed in chapter 20. The somewhat heterogeneous chapter 20 of the first edition on The integration of the cell is now represented by three chapters, 21–23, the first two mainly concerned with nuclear-cytoplasmic interactions and cytoplasmic inheritance, and the last with virus genetics. The final chapter of the first edition, The evolution of heredity, is also represented by two chapters, 24, with the same title, and 25, Initiative in evolution.

The stimulating qualities of the first edition and the bold speculative sweep of the author were generally recognized. The development of genetics within the last twenty years has however produced many changes, notably in respect of cellular biochemistry, microbial genetics and mathematical genetics, which render the present edition less representative of the present climate of genetic opinion than the earlier. Wright's theory of genetic drift, for instance, is dismissed as unimportant in the course of a couple of paragraphs only on p. 236.

One is a little surprised at the author's harping so insistently on the necessity for sexual recombination for evolutionary change. He goes so far as to lay down that "evolution ceases when the mechanism for recombination is stopped". Investigators working with vegetatively reproducing plants are well acquainted with their extreme variability and the evolutionary significance of this situation has been discussed in several recent publications, in particular by the Sharmas [XXVI, 1979 and XXVIII, 63].

The influence of the Oxford logicians on the present edition appears to be negligible. While everyone will concede the propriety of a vague use of such terms as *contradictory*, *certainty*, *foresight* and *initiative* in literary prose, many biologists would prefer that such terms be handled more precisely in a genetical discourse than is the case here. However, Professor Darlington has consistently stood out against the tendency of many geneticists to take their own abstractions too seriously and his discussion of the breakdown of the distinction between heredity and development in chapter 22 is cogent and illuminating.

3563 OPARIN, A. I.
The origin of life on the earth.
Oliver & Boyd, Edinburgh & London,
1957 : 3rd Ed. : 35s. : Pp. xviii + 495 :
44 figs.

The value of Professor Oparin's conception of the origin of life is that it takes a coldly rational view of this vexed problem, projecting the Darwinian principle of evolution by selection of the fittest as it were backwards into the primeval ocean where the first living beings are supposed to have developed. In the first chapter he cites examples of beliefs in spontaneous creation in the various eras, from the early Egyptians down to the present time, the examples of the last group including the much publicized work of O. B. Lepešinskaja [XXI, 1509] referred to as "a complete fiasco". The second chapter is on the eternity of life and evidence is cited in support of the belief that planets such as the earth exist in other solar systems and are capable of supporting life, though no evidence has been found to suggest that it was transferred from them to the earth.

The mechanistic approach of Haeckel, Darwin, Osborn, Pflüger and others is described in chapter 3, together with some more obscure ideas such as the biophores of Weismann, the mycoplasm of Mereškovskij and the osmotic algae of Leduc; finally the evolutionary principles defended by Engels, Schäfer, Bernal and the author are contrasted with the appeal to chance made by the adherents of the gene theory.

The special properties of the organic compounds of carbon are discussed in chapter 4; the author holds that the autotrophic organisms are far too complex to be considered as the primitive forms of life and that the first living beings found organic compounds, abiogenically formed, already present on the planets when they arose; evidence is adduced showing the presence of hydrocarbons on the planets, in the meteorites, comets, the stars and even interstellar gas and dust; an outline is given of the views of Urey and others, according to which the solar system arose by aggregation of nebular dust, the earth's atmosphere underwent a transition from the reduced to the oxidized state and there occurred on its surface the abiogenic formation, first of the simplest and later of more complex organic compounds. Many ways in which this could have come about, with electric discharges in the atmosphere, solar ultraviolet radiation and possibly radioactive discharges serving as sources of energy, are examined in chapter five; firstly such simple substances as methane, ammonia, water vapour and hydrogen sulphide were transformed to more complicated substances in the atmosphere; these were washed into the hydrosphere, where the mixture of inorganic substances acted as catalysts for further interactions which led to still more complex oxygen, nitrogen and sulphur-containing derivatives of the hydrocarbons. Even characteristic properties of organic compounds such as optical activity could, it is argued, have arisen before the origin of life, as a result of increasing complexity, possibly under the influence of polarized ultraviolet radiation, or of optically active crystals acting as catalysts, possibly even without. A great number of experiments in which syntheses of this type have been performed in the laboratory are reviewed.

The structure of polypeptides, proteins and other biologically active compounds is examined in chapter 6. It is argued that the remarkable standardization of the aminoacids that occur in the proteins of higher organisms, only twenty common ones being recognized, points to their having originated by natural selection of the most efficient rather than by the operation solely of physical and chemical laws. Nevertheless the author finds it hard to agree with the suggestion of the primary origin of enzymes by the gradual selection of particles with structures more and more adapted to carrying out particular catalytic functions, since these functions are of no significance to the enzyme itself but only to the organism in which they take place. Experiments which claim to have performed this synthesis in the laboratory are considered unconvincing. Similarly with regard to the nucleic acids, it is emphasized that they do not act as independent entities in "reproducing themselves" but only as a part of a complicated apparatus; thus "on the one hand, the synthesis of proteins requires the presence of nucleic acids while, on the other, the synthesis of nucleic acids requires the presence of proteins (enzymes)". The development of such a system can, it is submitted, only have occurred as a result of the evolution of systems which, although more primitive, were nevertheless complete in themselves. At the moment of their formation these systems did not have the specific attributes of organisms. They were not alive and it was not until later that they assumed these organizational attributes and were transformed into systems which were new in principle and of a higher order, that is to say, into the first living things.

In the seventh chapter the principles of coacervation are explained; it is shown how coacervates can lead to chemical union between some of their constituents, and how the properties of coacervates resemble those of protoplasm, particularly in their tendency to form structures, their ability to adsorb substances from the surrounding equilibrium medium selectively, and their capacity to form structural molecular layers at the interfaces. A number of workers are cited as having drawn analogies between coacervates and such structures as chondriosomes, microsomes and even chromosomes. Complex coacervates would have formed readily in the high concentrations of the primeval hydrosphere. "Thus there were formed entire multimolecular systems, coacervate drops, each of which already had a certain individuality in contrast to all the rest of the external world surrounding it". This system would moreover be subject to a new set of colloid-chemical laws. The simplest abiogenic system which could have served as a starting point for the evolution of life must have been an open system, the separate reactions forming a network of interdependent chemical transformations coordinated in time.

How this could develop is the subject of chapter 8; the separation of distinct multimolecular systems in coacervate drops gave them the capacity for separate reactions; those drops in which the reactions were towards stability were preserved; some of them were not only capable of maintaining themselves but of expanding; at a certain stage some of the expanding drops might, under the influence of surface tension or other factors, divide. Thus competition would arise between the drops, those with the greatest chance of survival being those with the greatest rate of growth; but changes occurred too, and the ones that were preserved were those in which the network of reactions was so coordinated that there arose stationary chains of reactions that were constantly repeated. This is the point where, with the capacity for self reproduction, the property of life as such is regarded as having originated. In this conception stress is laid upon the principle that constancy of the formation of particular substances is a manifestation of the constancy of the sequences of the reactions leading to them, as opposed to self reproduction on the template principle. Occasional combinations formed within some of the coacervate drops may have had increased catalytic activity, which again would favour their selection and further evolution. By a succession of such steps the various enzymes involved in an ordered concatenation of successive reactions such as occurs in the Krebs cycle could be built up. The successive nature of the process as thus envisaged is thought also to account for the asymmetry of protoplasm and organic products.

Having arrived in this way at the first living beings, we are given a final chapter in which the metabolic processes occurring in contemporary organisms supposed to represent different levels of evolutionary progression are compared. Common features detected are the ability to use ready-made organic substances anaerobically as the starting materials for the construction of proteins and other components of protoplasm and as the immediate source of energy for this biosynthesis. Different groups show a variety of different capacities to synthesize certain constituents; each of these autotrophic systems must have been acquired independently at some time in the evolution from the basic heterotrophic system and the ease with which mutants lacking the capacity for synthesis can be obtained is taken as evidence that the ability is secondary and not a fundamental property of the organism. The frequency of symbiotic relationships is taken as evidence in the same direction, and many cases are cited of the conversion even of green plants to a heterotrophic condition by administering organic substances; similarly the chemoautotrophs are considered to be not primitive but derived types. In support of this view it is pointed out that no vestiges of an autotrophic mechanism can be found in the heterotrophic organisms. On the other hand, the existence of coenzyme A, which permits the combination of small organic molecules to combine together by carbon-carbon bonds, is universal in living organisms and made it possible for the autotrophic groups to develop. The ability for anaerobic degradation of carbohydrates on the lines of alcoholic fermentation is also universal and the subsidiary capacity to oxidize them to CO_2 and water probably developed later when the amount of oxygen on the earth increased. In his explanation of how this capacity for oxidization arose the author makes a curious lapse from his otherwise lofty rationalistic approach. We read that the depletion of the organic nutrients in the primeval medium "stimulated the organisms in their struggle for existence, in the process of selection and adaptation to the new conditions of life with which they were faced, to elaborate within themselves new forms of metabolism which would enable them, not merely to assimilate exogenous organic materials as rationally as possible, but also to use other means to obtain energy from the environment and to assimilate the simplest forms of carbon compounds". Thus an element of volition is implied. Yet he goes on to cite evidence showing that cytochromes arose in organisms inhabiting the globe while its atmosphere was still in the reducing state; porphyrin derivatives, which are also universal, were evidently present and in some organisms they occurred in the form of pigments which enabled them to utilize light as a supplementary form of energy. Such pigmented organisms were naturally selected, being able to make use of such substances as methane, H_2 and H_2S as hydrogen donors for the reduction of CO_2; in this process the O_2 content of the atmosphere became enriched. It was at this point that the chemoautotrophs, capable of using the energy of oxidation of mineral substances, are supposed to have originated. They were largely pushed into the background by the groups which further developed their metabolic systems in the direction of photosynthesis, which evolved, we are told, by the integration of a number of chemical mechanisms that had previously existed in separate groups of organisms. Then followed a new wave of evolution of heterotrophs, adapted to the complete oxidation of nutrients by means of atmospheric oxygen; very varied mechanisms for this transformation were developed in different groups of organisms and this is taken as confirmation of its being relatively of very recent origin.

Professor Oparin should be grateful to the translator for having presented his work in uncommonly readable and idiomatic English, with few lapses from established usage even in the involved scientific terminology. It must of course be pointed out that the translation was made in 1956 and works referred to in the text as having appeared "very recently" bear the date 1956.

3564 McLeish, J. & Snoad, B.
Looking at chromosomes.
Macmillan & Co., Ltd., London 1958 : 16s. : Pp. vii + 87 : 18 figs. : 48 plates.

This slender volume, which retells the now familiar story of the chromosomes in mitosis and meiosis, is unique in two respects: it exemplifies the entire course of chromosome behaviour by a single object, *Lilium regale*, and it illustrates it largely by reference not to the usual set of diagrams devoid of verisimilitude and bearing little resemblance to what the student sees down the microscope, but by a set of photographs of quite exceptional quality and clarity. The text, after a brief historical introduction, gives a lucid description of the plant cell at rest and in its various stages of division, during the formation of pollen and embryo sacs, and of pollination, fertilization and seed formation. These explanations are supplemented by a number of very clear diagrams and the significance of the phenomena described for the inheritance of characters and for evolution is emphasized.

3565 Knapp, R.
Einführung in die Pflanzensoziologie. I. Arbeitsmethoden der Pflanzensoziologie und Eigenschaften der Pflanzengesellschaften. (**Introduction to plant sociology. I. Working methods in plant sociology and properties of plant communities**).
Eugen Ulmer, Stuttgart 1958 : 2nd Ed. : DM 6.30 : Pp. 112 : 34 figs. : 17 tables.

The methods of analysing plant communities are described in the first part of this treatise by means of concrete examples. The basic principles of classification are outlined, it being pointed out that the Latin designations for types of community are often excessively dependent on viewpoints concerning their status, for which reason the less narrowly-defined German designations such as *Verband* are preferred.

Some of the ways in which the natural balance of species in a given community can be altered by human intervention in the form of agriculture, forestry or industry, on the one hand, and by natural factors on the other are described. Factors such as temperature, light, water, wind and fire are treated in turn, leading to soil factors, under which heading the main soil types are defined. Next come the main growth types and their relation to climatic and other factors. In this connexion it is stated that the degree of polyploidy tends to be greater than the average in hemicryptophytes, particularly in the first colonizers, and less than average in therophytes. Species with wide areas of distribution are said to have a higher degree of polyploidy than endemics or species with a relatively restricted area, with the consequence that southern Europe has less polyploids than northern Europe. The various phases of plant succession are considered together with the factors that control them. Finally, the types of distribution characteristic for different European species are described and as an illustration a somewhat detailed analysis is made of the floristic zones comprised in the valley of the upper Rhine lying roughly between Frankfurt and Heidelberg.

3566 Schmeil, O. & Fitschen, J.
Flora von Deutschland. (**German flora**).
Gustav Fischer Verlag, Jena 1958 : 67–68 Ed. : DM 9.70 : Pp. xii + 515 : 698 figs.

The Schmeil-Fitschen pocket flora has been a regular item of equipment of the German field botanist since the issue of the first edition in 1904. The present edition has the same general format as its predecessors but has been thoroughly revised throughout by H. Voerkel and G. Müller. Recent taxonomic studies have necessitated changes in the nomenclature of many species and some new species and subspecies have been included. The keys have been modified to accommodate these changes. An important improvement is the inclusion of much fuller indications of the frequency and distribution of each species. The present edition is intended for use in the German Democratic Republic only.

3567 Kotov, M. I. & Barbaryč, A. I.
(**Flora of the Ukrainian SSR**).
Akad. Nauk. URSR, Kyjiv 1957 : 33krb : 8 : Pp. 543 : 99 figs. : 1 map.

The eighth volume of the flora [cf. XXVI, p. 700] has now been issued. It covers the Metachlamydeae from the Pyrolaceae to the Boraginaceae.

3568 Degener, O.
Flora Hawaiiensis. Book 5.
Published privately : undated : unpaginated : figs.

The fifth part of this work maintains the excellent standard already set, particularly with respect to the illustrations [cf. XIX, p. 925]. As before, however, its appearance has been somewhat marred by variation in the size and style of type used, presumably related to the need to fit all the information concerning a species on to one or two pages for ease of filing. Keys to a further nine families are included and a temporary index, for this volume only, lists common Hawaiian and English names and scientific names and synonyms. The index is not easy to use since the numbers refer to the family and not to a specific page and the capitalizing of specific and varietal names in the index is likely to cause some unnecessary confusion and annoyance.

3569 Lauche, R.
Internationales Handbuch der Bibliographien des Landbaues / **World bibliography of agricultural bibliographies.**
Bayerischer Landwirtschaftsverlag GmbH, München 1957 : DM 49 : Pp. xv + 411.

This volume, stated to be the first general international catalogue of agricultural bibliographies, contains references to 4157 bibliographies dealing with agricultural topics, ranging from the date 1596 to 1957. Many of the entries, it is true, are not bibliographies in the strict sense and include such things as dictionaries, library catalogues and guides, systems of classification, encyclopedias, handbooks and the titles of many periodicals dealing with subjects related to agriculture. The entries are classified under general, science in agriculture, soil and plant, animals, agricultural engineering, social sciences, agricultural products, forestry and veterinary science, and these main groups are subdivided into various finer divisions and finally by countries. The text is in German but headings are also in English and there is an English key to the symbols used to supply subsidiary information. The subject index is also in German and English. There is an author and title index and the locations in libraries in Germany and Austria are given by means of symbols, for which a key is provided at the end of the volume.

The bibliography will undoubtedly serve as a useful source of reference, though its price will be likely to limit subscribers to the richer institutions. It is to be kept up to date by a series of annual supplements.

3570 Klapp, E.
Lehrbuch des Acker- und Pflanzenbaues. (**Text book of field and crop cultivation**).
Paul Parey, Berlin & Hamburg 1958 : 5th Ed. : DM 34.80 : Pp. viii + 503 : 226 figs. : tables : plates.

Sound husbandry should, it is maintained, be aimed at increasing both the yields of the crops and the fertility of the land. This text book gives the student first a general outline of the principles of plant physiology and the role of various climatic factors in influencing plant development; next come the properties of the main types of soils, the principles of manuring, the effects on the soil of various farming operations, and crop rotations. There follows a section on seed, in which the various factors that affect seed quality are analysed; one of these is provenance; in the case of many cross-fertilized plants seed from different localities may comprise material differing in hereditary constitution, as a result of natural selection; in self-fertilized plants seed of different provenance may differ in such properties as sugar and protein content, and osmotic pressure, and hence vitality, yielding ability or disease resistance. The importance of correct choice of variety is stressed and the need for more detailed information on the merits and defects of agricultural cultivars is mentioned. Some of the outstanding achievements of plant breeders are named.

In the second half of the book an outline is given of the botanical characteristics of the main cereals, legumes, roots and tubers, fibre plants, tobacco and forage plants grown in Germany. Brief indications are given concerning the origin of each crop and of the methods of cultivation, chief diseases and pests and principal uses. The species and varieties are described and the merits and defects of certain products of modern developments such as tetraploid rye, hybrid maize and monogerm sugar beet are debated.

The volume is admirably printed and well illustrated, being provided also with lists of relevant literature at the ends of the appropriate sections.

3571 Cowan, S. T. & Rowatt, E. (Editors). **The strategy of chemotherapy. Eighth Symposium of the Society for General Microbiology held at the Royal Institution, London, April 1958.** University Press, Cambridge 1958 : 35s. : Pp. viii + 360 : figs. : plates : tables.

The volume devoted to the eighth symposium maintains the high standard of previous issues [cf. XXVII, p. 594]. As pointed out in the editors' preface, the approach to chemotherapy has developed in two directions: the isolation of substances formed by microorganisms, and the synthesis of compounds related to essential metabolites. The first led to the discovery of penicillin and other antibiotics and the second to the sulphonamide group. The comparative failure of deductive chemotherapy is due, it is stated, to "gaps in our knowledge of metabolism of both host and invaders, and our neglect of the responses of the host". Contributors to this symposium were invited to suggest fresh ways of attacking the microorganisms without damaging the host. In The relation of strategy to tactics: some general biochemical principles, D. D. Woods and R. G. Tucker give a useful general introduction, from which we see that the development of resistance in the microorganisms is, for the medical pathologist as for the plant pathologist, one of the most serious problems still to be solved. One of the reasons for the success of the sulphonamides is evidently that they attack the synthetic processes of the organism at many points simultaneously, making it more difficult for the pathogen to find alternative pathways. This is a point that might well be borne in mind by breeders wishing to produce disease-resistant plants. In the section on synergism in the contribution on The antibiotic approach by H. B. Woodruff and L. E. McDaniel, a technique is described whereby sequential blocking may be practised in designing new chemotherapeutic agents and another whereby desired changes in chemical properties can be induced in an antibiotic by introducing specifically designed precursors; in this way a non-solvent-soluble, water-soluble penicillin, tetracycline and many other antibiotics with special properties have been prepared. We are thus passing from the empirical stage to that of planned production of compounds with known composition and action.

In Selective inhibition of bacterial cell-wall synthesis: its possible applications in chemotherapy, J. T. Park discusses a group of metabolites known to be essential for wall formation in a wide variety of bacteria but not utilized by animals, suggesting that cell-wall synthesis is for this reason particularly susceptible to attack by chemotherapeutic agents. Surface-active bactericides were discussed by B. A. Newton, who mentioned, *inter alia*, the development of bacteria resistant to them in certain, as yet rare, cases. In Membrane penetration and the therapeutic value of chemicals, P. Mitchell points out that the plasma membranes of bacteria are not simple inert lipoprotein films but contain enzyme and carrier systems that are responsible for linking the chemical reactions of metabolism to the transport of specific chemicals; thus permeability factors are seen to be just as complex as biochemical factors and probably indistinguishable from them.

H. A. Krebs spoke on Inhibitors of energy-supplying reactions and pointed to some of the differences that have been found between host and parasite cells in respect of the intermediary reactions of foodstuff degradation, the differences being mostly quantitative in nature.

Several contributors stressed the special nature of virus diseases, where the infecting organism usually has no membrane separating it from the host cells and no enzyme system of its own, its multiplication being intimately linked with the metabolism of the cell it infects. I. Tamm, in Selective inhibition of virus multiplication, reviews what is known of the mode of multiplication of animal viruses, the metabolic changes they induce in infected cells and the action of some substances that have been found to reduce the virus activity; one of his conclusions is that the unit of biosynthetic activity may be a ribonucleoprotein particle identical in structural features and energy requirements, regardless as to what is its source; there are however "reasons to think that subtle but important differences must exist among such particles from different cell-types as among viruses".

In Mechanisms of chemotherapeutic synergy, B. W. Lacey again examines the concepts of sequential and concurrent blocking. Other contributions dealt with metal-binding agents in chemotherapy, the designing of antimetabolites, lethal synthesis, specific inhibitors of protein synthesis, and the chemotherapy of bacterial infections, fungal diseases and protozoal infections; that on fungal diseases, by R. J. W. Byrde and G. C. Ainsworth, treats diseases both of plants and of man and higher animals; reference is made to the significance of work with biochemical mutants in *Venturia inaequalis* and other organisms for indicating differences in metabolism between parasite and host but the article, and indeed the volume, ends with these words: "It is clear that our knowledge of the biochemical nature of the plant-fungus and the animal-fungus relations is woefully inadequate. There is ample scope for fundamental studies which will ultimately lead to a more rational approach to the chemotherapy of mycotic infections".

3572 SMITH, K. M. & LAUFFER, M. A. (Editors). **Advances in virus research. Volume V.**
Academic Books Ltd., London 1958 : $9.50 : Pp. ix + 376 : figs. : tables.

This year's volume [cf. XXVII, p. 760] again contains contributions of interest to geneticists. Chief among them is Mating in the reproduction of bacterial viruses, by G. S. Stent. In a stimulating, though confessedly speculative, review of recently developed fields of enquiry, evidence is given for supposing that the decay of radiophosphorus exerts its lethal effects in phage and bacterial nuclei alike by severing a DNA molecule; in the case of X rays, some of the effects are of a similar nature and some are considered to be due to a chemical modification of the purine, pyrimidine, or deoxyribose residues, leaving the over-all structural integrity of the DNA macromolecule intact. The effects of ultraviolet rays seem to be all of the latter type, as indicated by phenomena of reactivation. Differences exist between strains of phage in their capacity to grow in bacterial cells damaged by ultraviolet, X rays or other agencies, the T-even phages being able to reproduce on highly damaged cells while the T1, T7 and λ group are unable to do so. The T-even group differ in other respects, including higher UV sensitivity and multiplicity-reactivability of the free particles, low UV sensitivity of the capacity of the bacterial host for reproduction of the phages, destruction of the bacterial nuclei during the eclipse period, progressive reduction of the radiosensitivity of the vegetative phage in single infection and frequent genetic exchanges between vegetative phages in multiple infection in the course of intracellular growth. All this leads to the conclusion that the phages of the λ type have a greater capacity for genetic interaction with the genome of the bacterial host. Two genetic structures are defined as homologous if they can undergo mating; if homology exists between genomes of phage and host, then gene interchange can occur; this, it is suggested, may be the cause of some of the host-induced modifications, of UV reactivation and the concomitant production of new genotypes and of a number of other phenomena. To explain the operation of this process a modification of the Watson-Crick system is proposed, involving the growth of a third polynucleotide chain within the deep groove of the DNA double helix, leading to a transient three-chain helical structure. The building blocks for the synthesis of the third chain could be "an amino-acid-ribonucleotide complex, so that a polypeptide backbone chain could grow on the outside of the DNA groove simultaneously with the growth of the polyribonucleotide chain on the inside. The newly synthesized ribonucleoprotein molecule would become intertwined with the parent DNA double helix and would unwind itself later out of the template groove". Further ribonucleoprotein molecules could be synthesized by the parental DNA template by repetition of the process, and the genetic information of the parental DNA double helices would come to reside in a single RNA chain. If two ribonucleoprotein molecules of identical base sequence meet they may mate, i.e. enter into a two-stranded helix and constitute an identical duplex, either of which may act as template for the further synthesis of DNA. In certain circumstances, for instance when a phage whose nucleoprotein chains were interrupted, mates in this way with a bacterial strand in which they are intact, a switch could take place and the intact strand could take over the functions of the template, leading to the observed genetic interchange. The hypothesis seems ingenious and will undoubtedly stimulate further fruitful experimentation and thought.

G. Bertani writes on Lysogeny, the lysogenic condition being described as representing "the most intimate type of interaction between a virus and a cell, that is, an interaction at the level of the genetic material". An outline is given of some of the more important recent results, published and unpublished, on the subject and many promising directions for further investigation are pointed out. In considering transduction it is stated that several steps in the process may be recognized, these being (*a*) incorporation of a piece of genetic material of the host cell (presumably DNA) in a phage particle; (*b*) introduction of it into a new host cell together with the DNA of the phage; and (*c*) stable incorporation (in the genetic and not necessarily in the physical sense) of it into the genetic material of the new host cell or of one of its descendants, presumably but not necessarily by a crossing-over mechanism. Between (*b*) and (*c*) many cell generations may elapse; during this time the transduced piece may or may not multiply. The frequency of transduction is, it seems, different for different markers and for different physiological conditions of the donor host cell. Though the idea of partial genetic homology between phage and bacterial chromosome is considered appealing, little or no convincing evidence for it has yet been found and most of the studies which are to clarify the interrelationships of the two are, we are told, still to come.

There is also a contribution by P. L'Héritier on The hereditary virus of *Drosophila.*

3573 Roemer, T. & Rudorf, W. (Editors)
Handbuch der Pflanzenzüchtung.
(**Manual of plant breeding**).
Paul Parey, Berlin & Hamburg 1956 : 2nd Ed. : Lief. 18 : Vol. 3 : Bogen 1–5 : 1–80; Lief. 19 : Vol. 3 : Bogen 6–10 : 81–160 : Lief. 20 : Vol. 3 : Bogen 11–15 : 161–240 : figs. : tables : DM 13.50.

Instalments 18, 19 and 20 [cf. 1089] all form part of volume III, the beginning of which is devoted to Kartoffel [Potato]. Section I, in English, is on taxonomy, cytology and crossability, by J. G. Hawkes. Section II, by H. Ross, is entitled Ausgangsmaterial für die Züchtung [Initial material for breeding], section III, by W. Rudorf, Entwicklungsphysiologische Grundlagen [Bases of developmental physiology], and IV Grundlagen und Methoden der Züchtung [Bases and methods of breeding]; this section is itself divided into a number of subsections, A being on Resistenzeigenschaften und ihre Vererbung [Properties of resistance and their inheritance]; part 1 of this is Resistenzzüchtung gegen pilzliche und bakterielle Krankheiten der Kartoffel [Breeding for resistance to fungal and bacterial diseases of the potato] by N. O. Frandsen, part 2 is Blattrollresistenzzüchtung [Breeding for resistance to leaf roll] by M.-L. Baerecke, part 3 is Resistenzzüchtung gegen die Mosaik- und andere Viren der Kartoffel [Breeding for resistance to mosaic and other virus diseases of the potato] by H. Ross, part 4 is Resistenzzüchtung gegen den Kartoffelkäfer [Breeding for resistance to Colorado beetle] by M. Torka, part 5 is Resistenzzüchtung gegen den Kartoffelnematoden (*Heterodora rostochiensis* WR) [Breeding for resistance to potato eelworm (*H. rostochiensis* WR)] by H. Ross and part 6 is Frostresistenz [Frost resistance] by W. Rudorf; this part also contains some remarks headed Dürreresistenz [Drought resistance]. B comprises Mutabilität [Mutability] by W. Rudorf, C, Variabilität der Wertmerkmale und ihre züchterische Nutzung [Variability in quality characters and its utilization in breeding] by W. Rudorf and M.-L. Baerecke, and D, Zuchtmethoden [Breeding methods] by W. Rudorf. Section V is entitled Erhaltungszucht [Maintenance of pure stocks], by W. Rudorf. The bibliography to sections II to V covers some 25 pages.

In the middle of instalment 20 we come to the beginning of Beta-Rüben [Beets], by E. Knapp, which starts with a section devoted to the systematics, cytology and history of the genus *Beta* and its respective species and passes to the floral biology and then the breeding of sugar beet.

3574 33e beschrijvende rassenlijst voor landbouwgewassen 1958. (**Thirty-third descriptive variety list of agricultural crops, 1958**).
Rijkscommissie voor de Sammenstelling van de Rassenlijst voor Landbouwgewassen, Wageningen 1958 : f. 2.00 : Pp. 336 : tables.

As in previous editions [cf. XXVII, p. 761], this list contains information on all the varieties regarded as being of special value for cultivation in the Netherlands. The details given include the parentage and agronomic characters, both favourable and unfavourable, of all except varieties of minor importance, together with the names and addresses of the breeders and distributors. For some crops, tabulated data comparing the varietal characters are presented, English translations of the terms used in the table being provided in the English supplement.

3575 Gill, N. T. & Vear, K. C.
Agricultural Botany.
Gerald Duckworth & Co., Ltd., London 1958 : 63s. : Pp. viii + 636 : 262 figs. : tables.

The aim of this work is "to cover, at an elementary level, as much as possible of the rather wide range of topics now commonly accepted as forming part of the subject, and to bring together for the student's benefit some of the relevant information scattered through the literature of botany and agriculture". These topics, as treated in the present volume, fall into four sections: I, Plant breeding and crop improvement, including an outline of genetics, breeding and techniques and the organization of breeding, variety trials, seed production and seed testing in the United Kingdom; II, Crops, covering the botany not only of crops of agricultural importance in this country but also, in less detail, of crops grown elsewhere and also of the main vegetable crops; III, Farm weeds; and

IV, Diseases of farm crops. It is perhaps surprising to find that a text book referred to as elementary should, after only a short introductory chapter on the classification of plants, plunge straight into the technicalities of genetics and plant breeding without any preliminary account of the general morphology, anatomy and physiology of plants. However, the authors assume, perhaps not altogether justifiably, that their student readers will possess some knowledge of elementary botany, and on this assumption an outline of the main features of crop improvement forms a good starting point for the more detailed accounts which follow in the subsequent section.

The crop plants and weeds in their respective sections are arranged according to family. For each family its general agricultural importance is briefly discussed and its botanical characters noted, after which more detailed descriptions of the more important individual genera and species are given. In section II, under the Cruciferae, for example, are described the botanical and agronomic characteristics of *Brassica oleracea*, both its wild form and the numerous cultivated types, *B. napus* and its various groups and, briefly, *B. nigra* and other species, *Sinapis alba* and some minor cruciferous crop plants. The descriptions and diagrams of the different *Brassica* groups are exceptionally clear and include a discussion of the interrelationships of the different species and the possibilities of hybridization. Three keys to the identification of *Brassica* and *Sinapis* species, based on leaf, fruit and seed characters respectively, are also given.

Much care and thought have gone into the production of this book. The type and layout are a pleasure both to look at and to read. Many of the line drawings are very good and the authors have the excellent, and unfortunately unusual, habit of indicating the scale of each drawing. A number of the illustrations could, however, be improved: the diagrams of mitosis and meiosis on pages 25 and 27, for example, and many of the figures in the pathology section are much below the standard of the rest of the book. Among the useful features of the book are: the illustrated key to common lowland grasses in the vegetative state; the list of poisonous plants, their frequency, toxic principle and effects; the appendices with a glossary of botanical terms and a list of derivations of generic and specific plant names; and the sensible bibliographies at the ends of the sections, which, although omitting references to individual papers, list the most important books on the subject and also the chief research and abstracting periodicals.

There appear to be few errors; one is the incorrect use of the word cob to denote the ear rather than the axis of the ear in maize. Altogether this is a book which can be highly recommended and will undoubtedly become standard reading for agricultural students.

3576 Vavilov, N. I.
World resources of cereals, grain, leguminous crops and flax and their utilization in plant breeding. Agro-ecological survey of the principal field crops.
Izdatel'stvo Akademii Nauk SSSR, Moskva-Leningrad 1957 : 29 r. 45 k. : Pp. 462 : 167 figs. : 108 tables : 9 maps.

N. I. Vavilov, whose death on 2 Sept. 1942 deprived the world of an outstanding student of the plant resources of the world, left a number of manuscripts partially completed and partially prepared for the press. One of these was the introductory volume of a large work on the agroecological classification of the world resources of crop plants, which the Academy of Sciences of the USSR has now decided to publish. The minimum of revision has been undertaken and even the quite irresponsible versions of many words from other languages, particularly the Latin group, have been left unchanged. Thus we have *universable* for the French *inversable*, *carbanze* for the Spanish *garbanzo*, *genederia* for the Spanish *ganadería*, the Italian wheat Ardito [Bold] appears as Arditto [?], the Spanish term *candeal* for *Triticum durum* appears as a cultivar and so on. The contents of the volume are however of undoubted interest as providing an insight into the views of this great botanist after over twenty years of study of the crop plants of the world. After a brief introductory chapter indicating the scope and value of the world collection of crop plants established at Leningrad, the author gives an exposition of his views on the ecological differentiation of agricultural plants. Reference is made to forms of *Linum usitatissimum* varying from the tall upright flaxes of Pskov to the creeping winter forms from Asia Minor; the Abyssinian ecotype of *Triticum durum* is very uniform physiologically though extremely varied morphologically; in the Chinese ecotypes of *T. vulgare*, differences having been observed in the length of the vernalization phases, photoperiodic requirements, rhythm of development, rate of filling of the grain (2–3 days to 3–4 weeks), temperature requirements, reaction to various unfavourable effects of winter, requirements of hardening, reaction to drought at different phases of development, and to irrigation, manuring and various soil peculiarities, tendency to sprout and resistance to various diseases and pests and to lodging and shedding.

The important role of selection, conscious and unconscious, in improving the quality of crop plants in the past is illustrated by the unusual seed size of the Cuzco maize varieties and of the Mediterranean strains of many cereals, flax and legumes, the size of Japanese radishes and Spanish and Algerian onions, and the awnless and short-awned barleys of China and Japan. In most cases it is thought that natural and artificial selection have acted in the same direction in leading to size increases. In certain northerly areas such as Archangel and Burjat-Mongolia, where climatic conditions are unfavourable for flowering, selection has led to the evolution of self-pollinating forms of rye and apogamous forms of *Poa alpina* and *P. alpigena*. White-flowered and white-seeded flaxes have evolved in oases and other isolated places, where there is a strong tendency towards self pollination. The same factors have probably led to the selection of liguleless wheats and rye in the vicinity of Pamir.

Plants growing as weeds frequently come, by selection, to resemble the crop in which they grow. Instances of this phenomenon given are forms of bread wheat in fields of *T. durum*, *T. turgidum* or *T. persicum*, oats in fields of *T. dicoccum* or *T. turgidum* and *Camelina sativa* in flax.

The second chapter gives data on the beginnings of cultivation of some of the main crop plants in different parts of the world. The oldest centres of all are thought to be Asia Minor, Egypt and adjacent areas, where cultivation began some 6000 years BC.; barley, wheat, rye, flax and many legumes were taken into cultivation in this area, which contains the largest number of wild species closely related to the crops concerned, including species of *Aegilops* and *Haynaldia*; it also saw the origin of the plough and of the old-world species of cattle and horses. The ecological conditions of the different sections of this extensive zone and of adjacent areas and of the crops grown there are described in chapter 3. The arid inland zone of Syria and Palestine is characterized by the low stature of the flax and legumes found there and the frequent occurrence of *T. dicoccoides*, *Hordeum spontaneum*, *Pisum humile*, *P. fulvum* and other wild peas, a form of hard wheat, *T. durum* var. *horanicum*, distinguished by extremely strong straw and compact ears, and a number of species of *Aegilops*. The cultivated forms in this area are characterized by earliness and drought resistance. Inner Mongolia contains many interesting wheats [cf. XX, p. 183], many species of *Aegilops* and rye, including *Secale montanum*, while western Anatolia contains *S. ancestrale*, wild species of lentil and pea-like types of *Cicer arietinum*. The humid subtropical zone of Asia Minor, which extends into Abhazia and Adžaria in the Georgian SSR, includes virgin forests dating from the tertiary period, containing many endemics such as *Albizzia julibrissin*, *Parrotia persica* and prostrate forms of flax and lentil.

The area of the Caucasus is unique in the diversity of its cultivated and wild floras. These include wild forms of *T. monococcum* and *T. dicoccoides*, disease-resistant cultivated wheats such as *T. timopheevi* and *T. persicum*, wild barleys (*H. spontaneum*) and ryes (*S. vavilovii*, *S. daralagesi*, *S. chaldicum* and *S. dighoricum*), weed forms of oats in fields of barley and emmer, and a leguminous plant combining the characters of pea and vetch, assigned to a new genus *Vavilovia*. The whole range has been found in rye from the perennial wild forms to the spring forms with brittle rachis growing as weeds in fields of wheat and barley. The annual rainfall in the Caucasus varies from 180 mm. to over 3000 mm. and other ecological conditions are equally varied. Among the cultivated species found there are winter barleys more hardy than any in the world, endemic wheats such as *T. timopheevi*, *T. macha* and *T. georgicum*, forms of *T. persicum* and naked barley free from sprouting in the ear and some valuable forms of *T. vulgare* and *T. turgidum*; in the mountains of Azerbaijan a characteristic wheat known as Dolis-Puri [Drum wheat], having soft awns and many resemblances to *T. persicum*, is widely cultivated. *T. persicum* occurs in the high mountain areas of Dagestan; it is distinguished by resistance to mildew and many rusts, earliness, freedom from sprouting and vitreous grain. Though it is a 14-chromosome wheat and gives fertile hybrids with *T. durum*, it is ecologically more similar to the bread wheats and could be used in crossing with *T. durum* to extend its range northwards. The arid mountains of Armenia contain wild *T. dicoccoides*, *T. monococcum*, *T. urartu*, *H. spontaneum*, a wide range of *Aegilops* spp., the wild ryes *S. vavilovii* and *S. daralagesi*, many cultivated forms of *T. compactum* and the endemic drought-resistant wheat *T. vavilovii*.

To the east of Armenia, in Karabah, large-grained forms of *T. monococcum* and *T. dicoccum* are found, and in Nahičevan a group of soft wheats, *T. vulgare* subsp. *irano-turkestanicum*, resembling those of Iran but distinguished by greater resistance to leaf rust. The standard form of *T. durum* for Azerbaijan, Apulicum 077, excels even the Mediterranean hard wheats in productivity; it contains admixtures of bread wheats resembling *T. durum* in form of ear and glumes. The wheats of Apšeron, the driest zone of all, are exceedingly resistant to low soil humidity. The most winter-hardy wheats of all are found in the high ground of the North Caucasus.

The whole of Soviet Central Asia and the adjacent areas of Iran, northern Afghanistan and Sinkiang, and parts of Kirgizia and Kazahstan, comprising what is referred to as the Iran-Turkestan agroecological zone, is characterized by low rainfall, hot summers and cold winters and contains some highly drought-resistant forms of cereals and legumes, most of the wheats being of the *speltiforme* or *rigidum* types. Some of the earliest cottons of the world, representing local forms of *Gossypium herbaceum* and imported forms of *G. hirsutum*, are found at Turfan in Kašgaria. The region of Kabul in Afghanistan is characterized by winter forms of *T. compactum* with closely enclosed grain, some of which are relatively resistant to brown and yellow rust, in contrast to those of Central Asia which are almost all susceptible. Giant ryes with large anthers and grains occur in the Pamir and Badahšan areas with altitudes of over 3000 m. Naked barleys are also characteristic of these very high areas and of Tibet.

In Kazahstan and Kirgizia most of the varieties are introductions from European Russia, western Siberia and Central Asia. The characteristic features of the wheats of northern India are their small ears and grains and smooth awns. Legumes and flax are also small-seeded, whereas in central India there occur some large-seeded flaxes. On account of their earliness, high quality and disease resistance some of the Indian wheats have been used as parents and the variety Novinka is a product of one of these crosses. The Baluchistan wheats are distinguished by great resistance to drought.

The mountainous areas of Arabia contain some of the earliest maturing forms of *T. durum*, *T. dicoccum*, barley, pea, lentil, vetch, lucerne, *Trigonella* and other legumes.

In Ethiopia rye is absent altogether and oats occur only as weeds (*Avena abyssinica* and *A. vaviloviana*). Most forms of wheat, barley and legumes grown are very early. There is an exceptional diversity of these plants and of flax, as well as a number of endemic species such as *Eragrostis abyssinica* and *Musa ensete*. Awnless forms of *T. durum* and wheats with purple grains are found, and an endemic barley, *H. sativum* subsp. *aethiopicum*, characterized by large grains, resistance to bunt and smut, standing capacity and a certain degree of sterility in crosses with many east-Asiatic and Eurasian barleys. The peas of Ethiopia have large seeds and a high protein and cystine content.

The cereals, legumes, flax and vegetables of the Mediterranean area are distinguished by the size of their fruits, seeds, flowers and other organs, which is thought to have resulted from both natural and artificial selection. Many disease-resistant forms are found; these include *Avena byzantina* resistant to loose smut and crown rust; large-seeded flax forms resistant to *Melampsora lini*, *Polyspora lini* and *Colletotrichum linicola*, and many wheats resistant to smuts and rusts. Forms of *T. durum* with easily detached grains are found in the Atlas mountains; also wild beans, *Vicia pliniana*, with affinities to the Afghan beans. The islands of Cyprus and Crete contain, in addition to the liguleless *T. durum* strains in Cyprus, a number of other characteristic endemic forms.

One of the special features of Japanese agriculture is the series of short-strawed, short-eared barleys with short awns or even without awns; others are the winter and semiwinter forms of naked barley. The wheats too are short strawed and dense eared, whereas in some of the more humid regions of south-eastern China some of the laxest-eared wheats known are to be found. Awnless forms of *T. durum* also occur in China, together with hooded wheats and *inflatum* forms; they have a more rapid development in the later phases of grain formation than any wheats known. A number of common features between the Chinese and Indian wheats have been observed.

The high inland zones of Spain, Portugal, Italy and Greece are ecologically distinct from the Mediterranean area and are treated separately. Thessalonica contains wheats intermediate in character between *T. durum* and *T. turgidum*, and northern Spain a wide range of spring forms of *T. spelta*, of *A. brevis* and *A. strigosa* and of local ryes. *T. spelta* is also to be found in Switzerland and the high ground of southern Germany, where *T. monococcum*, *T. dicoccum* and *T. turgidum* also occur; some of these forms of *T. monococcum* are even winter forms and those of *T. dicoccum* are winter hardy.

The wheats of north-western Europe are mostly too susceptible to frost for use in the USSR but many varieties of two-rowed malting barley and oats are of value. Mention is made of the persistence of *T. turgidum* 'Rivet' in England and of the many valuable varieties produced by plant breeders in France, Germany, Great Britain, the Low Countries and Scandinavia, the last-named being of interest for the Soviet Union on account of their earliness, low heat requirements, freedom from sprouting and lodging and relative resistance to yellow rust. The vast European plain has produced the Banat and Ukrainka wheats, *Vicia pannonica*, drought-resistant wheats and oats resistant to crown rust from Rumania and the Ukraine, the famous Krymka wheat from the Crimea, known in America as Turkey, drought-resistant barleys, dual-purpose flaxes and oil sunflowers from the Ukraine, the Hanna barleys from Czechoslovakia, Dańkow and other Polish ryes, Vjatka rye and Pskov flax from north-western Russia, the brown-eared wheats of Siberia, *T. vulgare* var. *fuliginosum*, capable of growing at altitudes of 1000 m. in the Altaj mountains, and weed hemp, *Cannabis ruderalis*, in Siberia. Eastern Siberia and northern Mongolia together comprise a distinct agroecological zone, the majority of the varieties of which have evolved, by natural selection under extremely severe conditions, from forms originating from China; they include a number of early spring wheats with short straw, small ears and grain and low heat requirements, and four-rowed barleys with short, smooth awns; east of lake Bajkal there occur some very winter-hardy ryes with a tendency towards self pollination.

In chapter 4 we find, in a more cursory form, similar data on the ecological conditions and the varieties of cereals, legumes and flax grown today in North and South America, Australia and South Africa. Attention is called to the important part played by wheats from northern Russia and Siberia and barleys from Ethiopia in breeding varieties suitable for Alaska and other northerly zones, by Russian wheats such as Krymka (= Turkey) in breeding such well-known varieties as Black Hull, Tenmarq and Ridit and by European lucernes and flaxes, European and Chinese wheats and *Avena byzantina* from Europe in producing the varieties now grown in Argentina. Many of the outstanding varieties grown in the respective countries at the time the manuscript was prepared are named, the account of the Australian varieties and their origin being rather fuller than that for the other areas, the Australian wheats in particular being considered promising for introduction into the Soviet Union. Attention is drawn to the degree to which the success of the wheat breeding programme in Australia is due to the rational choice of parental material, the high yielding ability of the western European wheats having been combined with the earliness and drought resistance of wheats from India and South Africa, and it is further pointed out that the Australian wheats produced from them have later been introduced with success into South Africa.

3577 KIHARA, H. (Editor).
Land and crops of Nepal Himalaya. Scientific results of the Japanese expeditions to Nepal Himalaya 1952–1953. Vol. II.
Fauna and Flora Research Society, Kyoto, Japan 1956 : Pp. x + 529 : figs. : tables : plates.

This volume provides an account of the vegetation of central Nepal in relation to the climate and topography, the agriculture of the region, and the results of studying the collections of cultivated and wild plants under Japanese conditions and in comparison with the principal Japanese varieties. So far the indigenous collections have on the whole shown little promise of possessing characters which would be useful in breeding, although some of the *Brassica* collections may be of immediate value in crop production. The photoperiodic response of the collections has in many cases caused difficulty in obtaining seed or in others has been responsible for early bolting. In addition, the collections have in general proved less resistant to diseases than Japanese varieties, and the vegetables have usually been poor in quality. The chapters on individual crops are abstracted below.

3578 *Kitamura, S. Taxonomy of some cultivated plants. (pp. 115–24).*
Taxonomic notes are given on cultivated species and botanical varieties belonging to the Cruciferae, Leguminosae and Compositae.

3579 *Matsuoka, M. Buckwheat. (pp. 125–33).*
Morphological descriptions of *Fagopyron esculentum*, *F. tataricum* and *F. cymosum* are provided, together with information on the altitudes of the localities where samples were obtained.

3580 *Matsuoka, M. Hemp. (pp. 135–39).*
Four races of wild hemp (*Cannabis sativa* var. *spontanea*) are described and, on the basis of observations made by the author and those

reported by Vavilov, compared with cultivated and wild hemps from various countries.

3581 *Nakao, S. & Sauer, J. Grain amaranths. (pp. 141–45).*
This account of the cultivation and use of *Amaranthus caudatus* and *A. leucocarpus* includes a discussion of the problem as to how the species were introduced into Asia.

3582 *Murayama, H. Spinach. (pp. 147–49).*
The four samples collected belong to *Spinacia oleracea* var. *spinosa*. Under artificial long-day conditions, ♀ and ♂ plants have occurred in a 1 : 1 ratio in each strain, no other sexual types having been observed.

3583 *Matsumura, T. Brassicae with 10 and 18 chromosomes. (pp. 151–66).*
Of the 39 *Brassica* collections examined, 27 had $n = 10$ and 12, $n = 18$. The group with $n = 10$ comprised four types of *B. campestris* and two of *B. rapa*. The former consisted of (1) a rape bolting very early, (2) a type similar to (1) but slower in bolting and therefore producing larger plants, (3) a yellow-seeded rape having a siliqua with 3 or 4 valves and (4) a type with ordinary siliquae and seed coloured a mixture of yellow and brown. The four rapes will probably be used as oil-seed crops. A highly variable type of *B. rapa* from low altitudes may also be useful for seed production for oil. Another type from high altitudes is the European type of turnip and may be suitable as a winter vegetable. The $n = 18$ collections were classified into the following types of *B. juncea*: (1) an early-bolting Indian mustard found as a weed in a wheat field, (2) a representative of var. *integrifolia* resembling the Japanese variety Karashina, (3) a bipinnatifid mustard, possibly similar to that assigned by Bailey to var. *longidens*, (4) a broad-leaved Indian mustard resembling the Japanese variety Aobo-takana, and (5) a broad-leaved type belonging to var. *cuneifolia*, resembling the Chinese variety Kuan sin koa-tsai or Ching-tsai.

3584 *Hujieda, K. & Watahara, T. Radish and cauliflower. (pp. 167–75).*
None of the radish collections showed promise as sources of desirable characters. Although the characters of their heads are unsatisfactory, the varieties of cauliflower merit further attention because of their disease resistance and tolerance of midsummer heat.

3585 *Kobayashi, T. Sesames. (pp. 177–85).*
Nepalese collections of *Sesamum indicum* grew vigorously and were much branched. They were ready for harvesting 20–30 days later than Japanese varieties. The collections had the same chromosome number ($2n = 26$) as the Japanese varieties but showed a high degree of meiotic irregularity and pollen abortion. Semi-fertile and sterile plants with respect to seed production were frequent; collections from lower altitudes tended to be more fertile than those from higher altitudes.

3586 *Nishimura, S. & Kageyama, M. Legumes. (pp. 187–90).*
Descriptions are given of seven species of vegetable or forage legumes, which are less well-known in Japan. Probably as the result of unsuitable photoperiodic conditions, many of the specimens have proved to be unfruitful in the neighbourhood of Hiratsuka, Japan, where they have been tested.

3587 *Nakao, S. Chilli. (pp. 191–92).*
Capsicum plants raised in Japan from seed obtained at Katmandu are briefly described. The sample is of the Cayenne type and closely resembles some of the older Japanese varieties, such as Fushimi-Kara.

3588 *Imazu, T. & Fujishita, N. Cucumbers. (pp. 218–28).*
Investigations were carried out on the wild cucumber (*Cucumis sativus* var. *hardwickii*) and a cultivated variety (var. *sikkimensis*) from Nepal and on two varieties, Daisenfushinari 1 and Taiwan-kema, grown in Japan. No useful characters were discovered in the Nepalese cucumbers, which were more susceptible to diseases than the Japanese varieties. Undesirable characters such as bitterness and black spines were dominant in crosses with the Japanese varieties. Data on fertility and meiosis indicated that the Japanese and Nepalese cucumbers are cytogenetically closely related. Long-day conditions had an adverse effect on ♀ flower formation in the Nepalese introductions.

3589 *Kimura, K. & Akabori, A. Drugs. (pp. 229–42).*
Descriptions are given of 16 drug plants, not all of which have been identified.

3590 *Suzuka, O. Chromosome numbers of pharmaceutical plants. (p. 243).*
The following $2n$ numbers are reported: *Artemisia sacrorum* and *A. roxburgiana*, 18; *Artemisia* sp., *ca.* 52; *A. dubia*, 54; *Anethum graveolens*, 22; *Coriandrum sativum* and *Coriandrum* spp., 22; *Plantago* sp., 12; and *Trigonella foenum-graecum*, 16.

3591 *Kurabayashi, M. Himalayan grasses.* (*pp. 245–47*).
Notes are given on the flowering behaviour of unidentified collections when grown at Sapporo.

3592 *Matsumura, S., Sakamoto, S. & Tateoka, T.* Agropyron *and its related genera.* (*pp. 249–53*).
[Cf. Abst. 3075].

3593 *Yabuno, T. Echinochloa.* (*pp. 255–59*).
The following strains of *Echinochloa crus-galli* are described: (1) 289–1 with $n = 18$, assigned to var. *oryzicola*; (2) 289 ($2n = 27$), morphologically very similar to var. *praticola*; (3) 508 and 563, both with $n = 27$ and with spikelets similar to those of var. *kasabarae*. Collection 315 ($n = 27$) shows a close resemblance to *E. colona* var. *frumentacea* of India. The F_1 of 289 x 315 had 27_{II} and was as high in pollen and seed fertility as the parents. The F_1 of 289 x 508 had $1_{\text{III}} + 16_{\text{II}} + 19_{\text{I}}$, $17_{\text{II}} + 20_{\text{I}}$ or $16_{\text{II}} + 22_{\text{I}}$ and was pollen and seed sterile. The F_1 between 508 and *E. crus-galli* var. *caudata* ($n = 27$) of Japan had 27_{II} and 48·6% pollen fertility.

3594 *Hirayoshi, I. African millet* (Eleusine coracana *Gaertner*). (*pp. 231–62*).
Data on dates and rates of heading of 30 collections reveal no relationship between ear emergence and locality or altitude.

3595 *Hamada, H. Ecotypes of rice.* (*pp. 263–312*).
The results of a study of 94 collections of lowland and upland rices with respect to 25 characters are reported. The general conclusion is reached that about 19%, 43% and 40% of the varieties pertain to the *japonica*, intermediate and *indica* types respectively. Rice of the subtropical region generally exhibits the characteristics of the *indica* type, whereas that of the temperate region is mainly of the *japonica* type.

3596 *Nakao, S. Barley.* (*pp. 313–43*).
The barleys collected have been classified under 35 botanical varieties, of which 12 are new. Sixteen of the varieties belong to convar. *intermedium*, which is considered to show a greater range of variation in Nepal than in any other country. On the basis of geographical distribution, three main groups may be recognized: (1) the Indian group in the lowlands where vars. *hybernum* and *breviaristum* [*sic*] are dominant, (2) the Himalayan group at altitudes of 1000–2500 m., where a rich diversity of *intermedium* and other barleys is to be found, and (3) the Tibetan group at altitudes of 2500–3600 m., where vars. *tibetanum*, *himalayense*, *coeleste* and *trifurcatum* are common and where *Hordeum agriocrithon* was found growing along with naked barley.

3597 *Nakao, S. Wheat.* (*pp. 345–53*).
All the wheats collected belonged to *Triticum vulgare*. They were classified into 17 botanical varieties, strains assigned to vars. *milturum*, *erythrospermum*, *pseudoingrediens*, *turcomanicum*, *ferrugineum* and *subbarbarossa* being of the most frequent occurrence. It is concluded that in general most of the wheats came from India. Similarities between the wheats of Nepal and southern or south-western China are pointed out. Possibly *T. vulgare* spread into China by way of the Himalayas.

3598 *Nakao, S. & Mori, S. Oats.* (*pp. 355–61*).
The wild oats *Avena strigosa* ssp. *barbata* and *A. fatua* sspp. *septentrionalis* and *fatua* and the cultivated oat *A. sterilis* ssp. *nodipubescens* were found.

3599 *Nakao, S. & Yabuno, T.* Hordeum brevisubulatum *Link.* (*pp. 363–64*).
The occurrence of the above species ($2n = 14$) in Nepal is reported for the first time.

3600 *Ono, T. & Suzuki, H. Chromosomes of maize.* (*pp. 365–72*).
The collections were mostly flints and popcorns. Except for three lots with one or two extra B chromosomes, they all had $2n = 20$. Six caryotypes, I–VI, were distinguished. Type I was found in 88% of the collections. Collections with caryotypes II–VI were usually dwarf and early maturing, most of them having been collected at the higher altitudes. The number of knobs observed at mitotic prophase ranged from 4 to 16, with a mean of 9·1. No knobless strains were found. In general, Nepalese maize shows a caryotypical resemblance to American and Japanese maize.

3601 *Sutô, T. & Yoshida, Y. Characteristics of the oriental maize.* (*pp. 373–529*).
[Cf. XXVII, 3999].

3602 **Detailed descriptions of varieties of wheat, barley and oats recommended by the National Institute of Agricultural Botany. Supplement 1958 : unpaginated.**
A further supplement to the handbook published in 1954 has been issued [cf. XXV, p. 456]. It consists of revisions of the lists of wheats, oats and barleys, together with detailed descriptions of the wheat Milfast [XXVIII, 1498] and oat

Powys [cf. XXVII, 448] which have been added.

3603 SEITZER, J.
Farbtafeln der Birnensorten. **(Colour plates of pear varieties).**
Eugen Ulmer, Stuttgart 1957 : DM 11.80 : Pp. 102 : 46 figs. : 44 plates.

The volume published in 1956 on apple cultivars [XXVII, p. 399] has now been followed by one on similar lines for pears and quinces. The descriptions of the 44 pear cultivars are accompanied by coloured plates, those of the 6 quinces by black-and-white diagrams. In his closing remarks the author makes a special defence of that aromatic though much neglected fruit the quince, pointing out that even Pliny in 23 AD was able to describe five cultivars.

3604 SINGH, L. B. & SINGH, R. N.
A monograph on the mangoes of Uttar Pradesh.
Lucknow 1956 : Vol. I : Rs. 14 : Pp. 144 : plates; Vol. II : Pp. 138 : plates.

This attractive handbook provides detailed descriptions, in nontechnical language, of 150 mango varieties, 75 in each volume, and should succeed in its aims of standardizing nomenclature and encouraging the growing of superior varieties by making varietal identification easier. The fruit and stone of each variety is illustrated, though only 50 of the plates are in colour, and the descriptions give details of tree habit and other characters and of fruit characters, those most important for identification purposes being italicized. Synonyms are given where they are known. In each case a particular tree is described, and its locality given, so that direct comparison should be possible in cases of doubt.

The varieties are placed in four groups, on the basis of fruit shape, and within each group they are separated into twelve classes on the basis of the veining of the stone and panicle colour. Within each class they are divided by leaf characters. Some space has been wasted by printing out the keys for each class under all four groups in both volumes, although not all groups contain varieties in each of the twelve classes, and since the plates are arranged in alphabetical order some means of cross reference to the place where the description is to be found in the text would have been helpful. The greater part of the book is devoted to the descriptions but there are three useful introductory chapters in the first volume on the history of mango cultivation and research in Uttar Pradesh and other parts of India, the methods used in preparing the descriptions and the characters used for identification. The index would have been more useful if the synonyms had been included; growers knowing a variety only by a rejected name will have to work through the keys to the description before being able to find its correct name. The information contained in this valuable book has taken more than five years to put together and it is clear that those concerned have not been idle during this time.

3605 10e beschrijvende rassenlijst voor groentegewassen (inclusief vroege aardappel, aardbei, tabak, geneeskrachtige en aromatische kruiden). **[Tenth descriptive variety list of vegetables (including early potatoes, strawberry, tobacco and medicinal and aromatic herbs)].**
Inst. Vered. Tuinbouwgewassen, Wageningen 1958 : f. 2.00 : Pp. 163 : figs. : tables.

As in previous editions [cf. XXVII, p. 400], this useful reference work lists and describes in detail all the approved vegetable varieties available in the Netherlands. The crops are arranged in alphabetical order under their Dutch names and the information given includes particulars of disease resistance and the name of the producer.

NEW JOURNALS

Agricultural College Journal, Osmania University.

This publication, the first issue of which is dated April 1954, is a students' magazine brought out by members of the Agricultural College Student Union, Osmania University, Hyderabad (Deccan). It contains articles on practical and technical aspects of crop production, including improvement by breeding.

New Zealand Journal of Agricultural Research.

This journal contains papers giving reports on research in various fields of crop and livestock production in New Zealand, including genetics. It is to be published in alternate months, the first issue having appeared in February 1958. Further information may be obtained from the Publications Officer, Department of Scientific and Industrial Research, P.O. Box 8018, Wellington. Price: 30s. per annum; single copy 5s.

Plant introduction newsletter, FAO, Rome.

This mimeographed newsletter, the first number of which was issued in November 1957, contains items on such topics as FAO activities in plant exploration, collection and introduction, expeditions to be undertaken by scientists in various countries, and requests by breeders for material. Further information may be obtained from Dr. R. O. Whyte, Plant Production Branch, Agriculture Division, FAO, Rome.

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